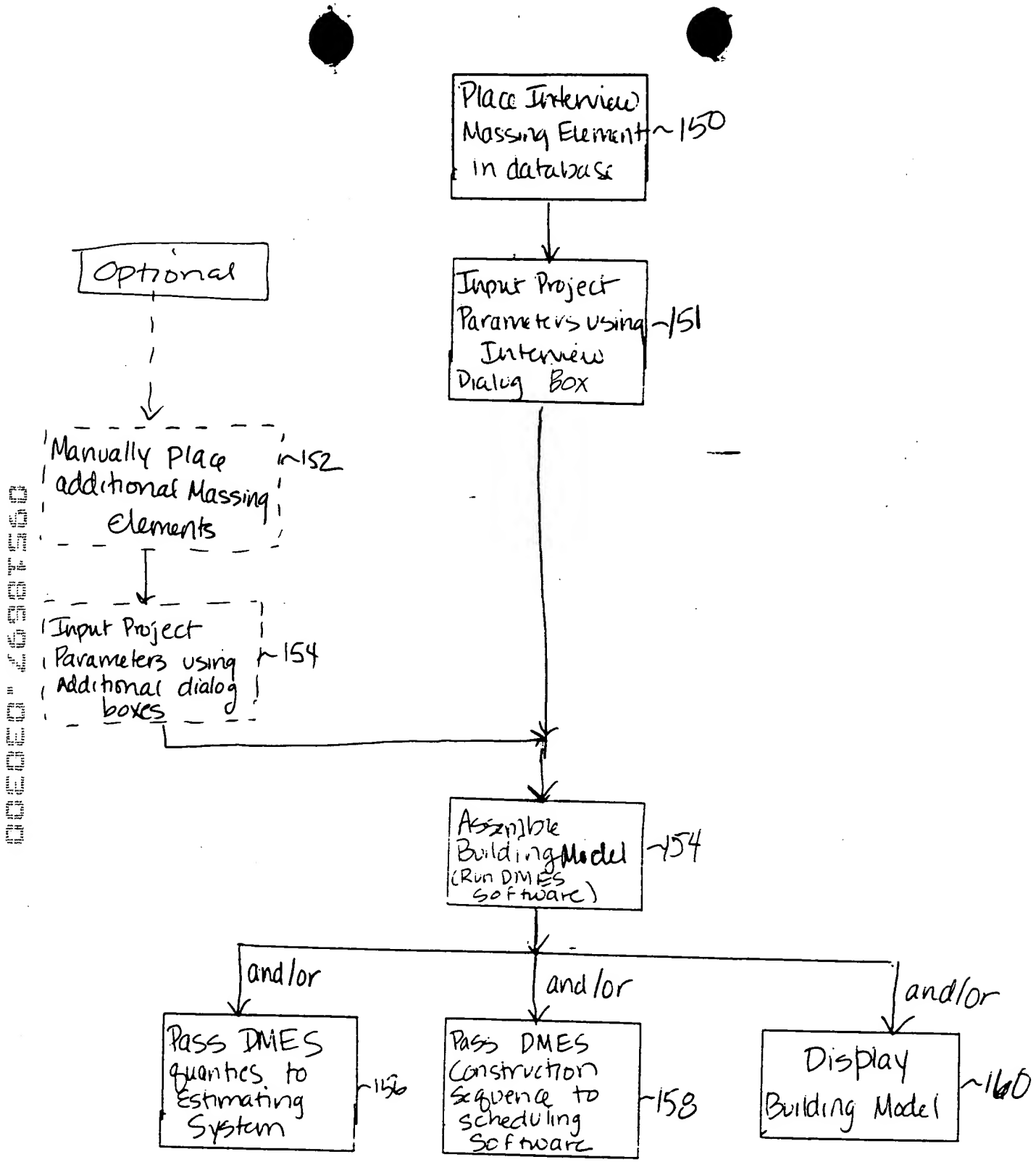
Place Interview Massing Element in database
150
Optional
Input Project Parameters using Interview Dialog Box
151
Manually Place additional Massing Elements
152
Input Project Parameters using Additional dialog boxes
154
Assemble Building Model (Run DMES Software)
154
and/or
and/or
and/or
Pass DMES quantities to Estimating System
156
Pass DMES Construction sequence to scheduling Software
158
Display Building Model
160

Fig. 1a

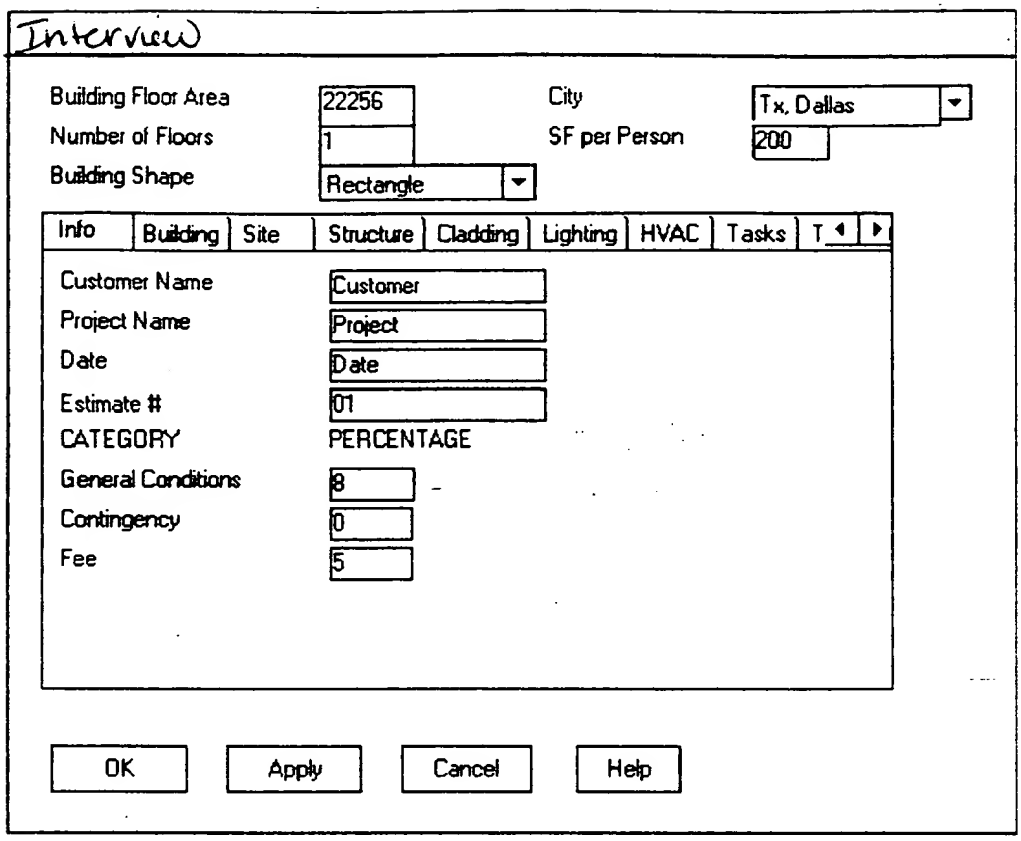
Interview
Building Floor Area
22256
City
Tx, Dallas
Number of Floors
1
SF per Person
200
Building Shape
Rectangle
Info
Building
Site
Structure
Cladding
Lighting
HVAC
Tasks
T
Customer Name
Customer
Project Name
Project
Date
Date
Estimate #
01
CATEGORY
PERCENTAGE
General Conditions
8
Contingency
0
Fee
5
OK
Apply
Cancel
Help

Fig. 1b

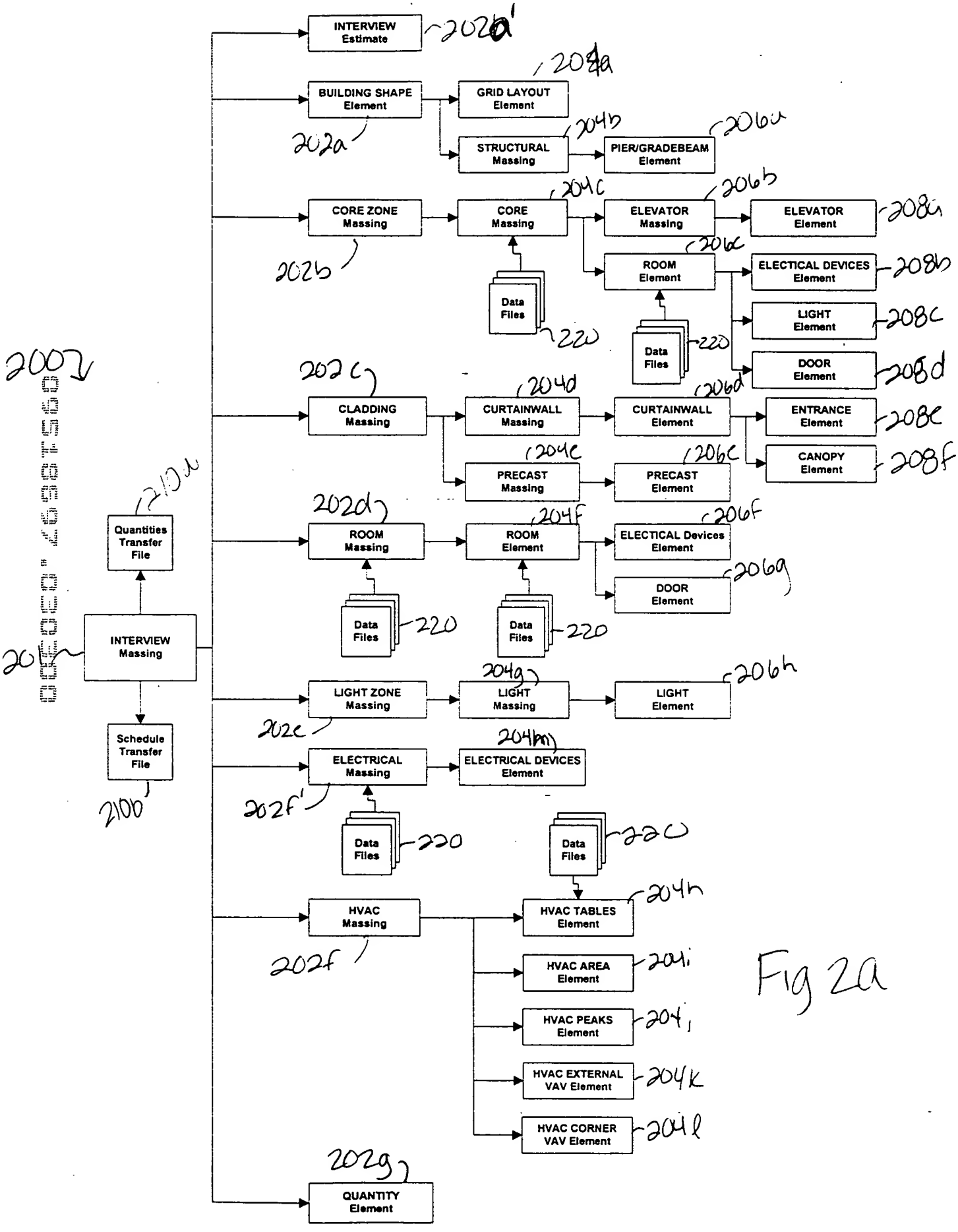
INTERVIEW Estimate
202a'
BUILDING SHAPE Element
202a
GRID LAYOUT Element
204a
STRUCTURAL Massing
204b
PIER/GRADEBEAM Element
206a
CORE ZONE Massing
202b
CORE Massing
204c
ELEVATOR Massing
206b
ELEVATOR Element
208a
ROOM Element
206c
ELECTICAL DEVICES Element
208b
LIGHT Element
208c
DOOR Element
208d
Data Files
220
Data Files
220
CLADDING Massing
202c
CURTAINWALL Massing
204d
CURTAINWALL Element
206d
ENTRANCE Element
208e
CANOPY Element
208f
PRECAST Massing
204e
PRECAST Element
206e
2002
Quantities Transfer File
210a
ROOM Massing
202d
ROOM Element
204f
ELECTICAL Devices Element
206f
DOOR Element
206g
Data Files
220
Data Files
220
INTERVIEW Massing
200
LIGHT ZONE Massing
202e
LIGHT Massing
204g
LIGHT Element
206h
Schedule Transfer File
210b
2100
ELECTRICAL Massing
202f'
ELECTRICAL DEVICES Element
204h
Data Files
220
Data Files
220
HVAC Massing
202f
HVAC TABLES Element
204n
HVAC AREA Element
204i
HVAC PEAKS Element
204j
HVAC EXTERNAL VAV Element
204k
HVAC CORNER VAV Element
204l
QUANTITY Element
202g

Fig 2a

Values Passed between Interview and Core Zone

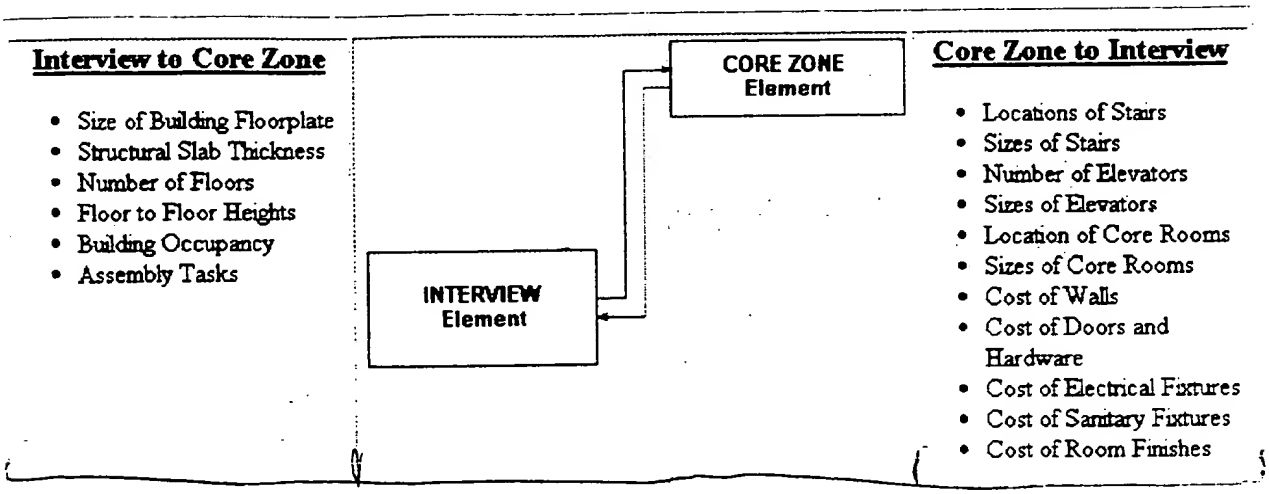

Fig 2b

Values Passed between Core Zone and Core Massing

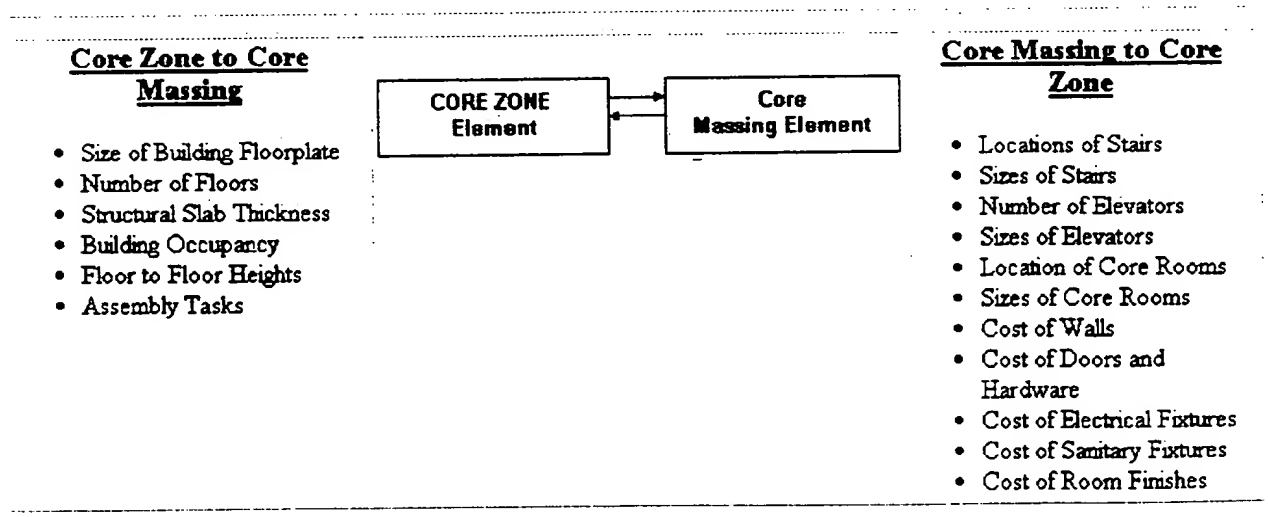

Fig 2c

Values Passed between Core Massing and Elevator Massing Element

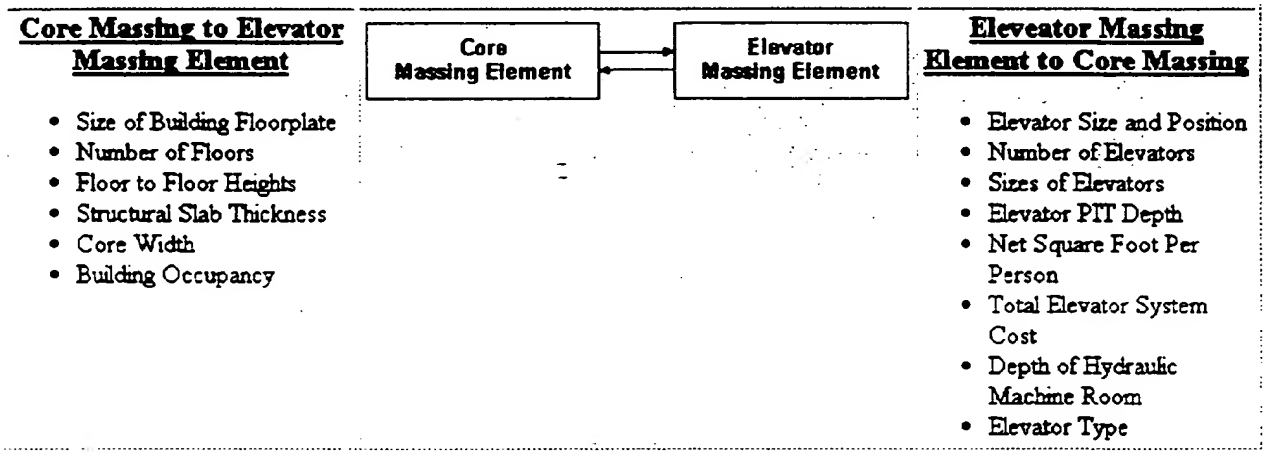

Fig. 2d

Values Passed between Elevator Massing and Elevator Element

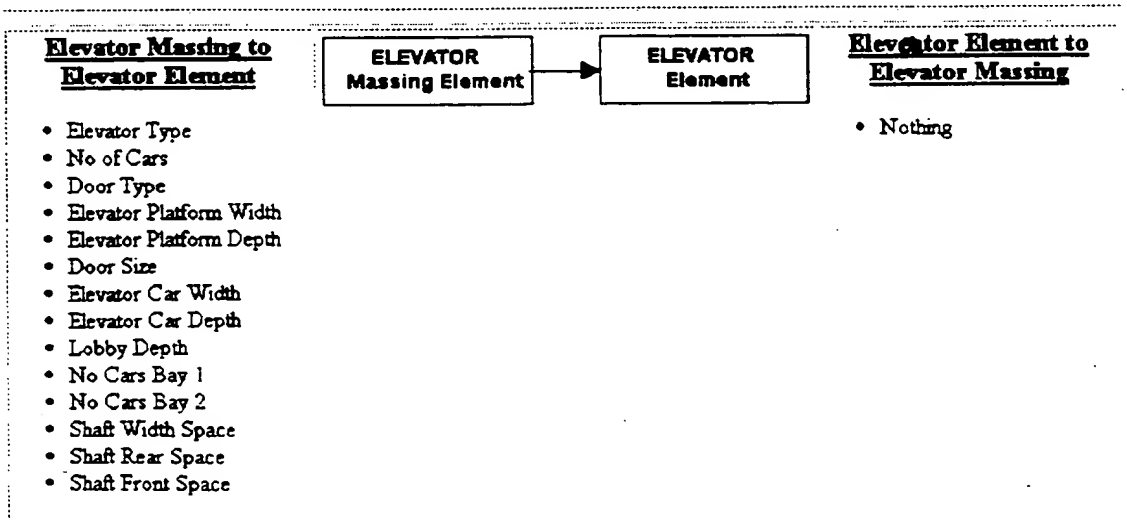

Fig. 2e

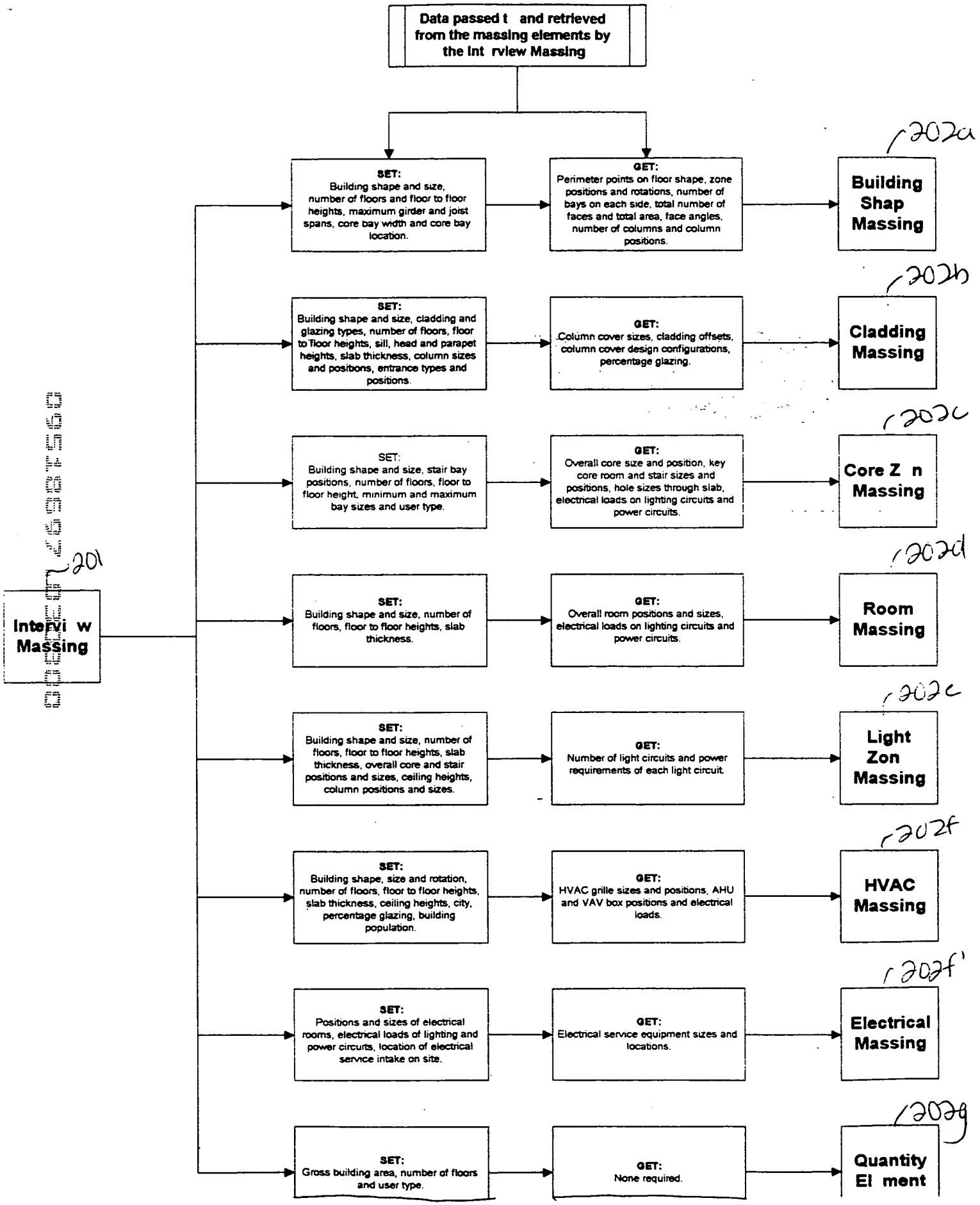
Data passed t and retrieved from the massing elements by the Int rview Massing
Intervi w Massing
201
SET:
Building shape and size, number of floors and floor to floor heights, maximum girder and joist spans, core bay width and core bay location.
GET:
Perimeter points on floor shape, zone positions and rotations, number of bays on each side, total number of faces and total area, face angles, number of columns and column positions.
Building Shap Massing
202a
SET:
Building shape and size, cladding and glazing types, number of floors, floor to floor heights, sill, head and parapet heights, slab thickness, column sizes and positons, entrance types and positions.
GET:
Column cover sizes, cladding offsets, column cover design configurations, percentage glazing.
Cladding Massing
202b
SET:
Building shape and size, stair bay positions, number of floors, floor to floor height, minimum and maximum bay sizes and user type.
GET:
Overall core size and position, key core room and stair sizes and positions, hole sizes through slab, electrical loads on lighting circuits and power circuits.
Core Z n Massing
202c
SET:
Building shape and size, number of floors, floor to floor heights, slab thickness.
GET:
Overall room positions and sizes, electrical loads on lighting circuits and power circuits.
Room Massing
202d
SET:
Building shape and size, number of floors, floor to floor heights, slab thickness, overall core and stair positions and sizes, ceiling heights, column positions and sizes.
GET:
Number of light circuits and power requirements of each light circuit.
Light Zon Massing
202e
SET:
Building shape, size and rotation, number of floors, floor to floor heights, slab thickness, ceiling heights, city, percentage glazing, building population.
GET:
HVAC grille sizes and positions, AHU and VAV box positions and electrical loads.
HVAC Massing
202f
SET:
Positions and sizes of electrical rooms, electrical loads of lighting and power circuits, location of electrical service intake on site.
GET:
Electrical service equipment sizes and locations.
Electrical Massing
202f'
SET:
Gross building area, number of floors and user type.
GET:
None required.
Quantity El ment
202g

Fig. 2f

Interview Massing	Allows input of design requirements from customer and initiates automatic assembly of building model by placing instances of the next tier of massing elements in the hierarchy and passing them appropriate design parameters. This massing element also places an instance of the interview estimate element, which is automatically passed quantity data directly from each of the elements in the hierarchy.
Interview Estimate	Placed by the interview-massing element, this element is automatically passed quantity data by the other elements in the hierarchy when they are executed. It then generates a graphical spreadsheet in the database, which displays the cost estimate data.
Cladding Massing	Placed by the interview-massing element, this element is automatically passed the building parameters and the requirements for the cladding. It then assembles the appropriate cladding types on each part of each elevation of the building model by placing the curtainwall massing and precast massing elements as required.
Curtainwall Massing	Calculates the curtainwall cladding and glazing requirements for the building from the building parameters passed to it by the interview-massing element and design data read in from external data files. This element then assembles the curtainwall cladding and windows around the building by placing consecutive instances of the curtainwall element and the parapet, entrance and canopy elements.
Curtainwall Element	Designs the individual curtainwall or glazing panel from design parameters passed to it by the curtainwall-massing element. This element also calculates an accurate set of quantities for materials and components used to assemble the panel. The element can also place instances of the entrance and canopy elements when required, and pass them appropriate design parameters.
Parapet Element	Designs the individual roof parapet sections from design parameters passed to it by the curtainwall-massing element. This element also calculates an accurate set of quantities for materials and components used to assemble the parapet section.
Entrance Element	Designs the individual entrance doors and panels from design parameters passed to it by the curtainwall element. This element also calculates an accurate set of quantities for materials and components used to assemble the entrance.
Canopy Element	Designs the individual canopies over the main entrances from design parameters passed to it by the curtainwall element. This element also calculates an accurate set of quantities for materials and components used to assemble the canopy.
Curtainwall Estimate	Placed by the curtainwall-massing element, this element is automatically passed quantity data by the curtainwall elements when they are executed. It then generates a graphical spreadsheet in the database, which displays the cost estimate data for the curtainwall cladding and glazing.
Precast Massing	Calculates the precast cladding requirements for the building from the building parameters passed to it by the interview-massing element and design data read in from external data files. This element then assembles the precast panels around the building by placing consecutive instances of the precast element.
Precast Element	Designs the individual precast panel from design parameters passed to it by the precast-massing element. This element also calculates an accurate set of quantities for materials, components and labor used to assemble the panel.
Precast Estimate	Placed by the precast-massing element, this element is automatically passed quantity data by the precast elements when they are executed. It then generates a graphical spreadsheet in the database, which displays the cost estimate data for the precast cladding.
Core Zones Massing	Placed by the interview-massing element, this element is automatically passed the building parameters and the requirements for the various core layouts. It then assembles the appropriate core layouts into each zone on each floor of the building model by placing the core massing element as required.
Core Massing	Calculates the core requirements for the building from the building parameters passed to it by the interview-massing element and design data read in from external data files. This element then assembles the rooms in the core of the building by placing the elevator massing element and consecutive instances of the room element.
Room Massing	Calculates the room requirements for the building from the building parameters passed to it by the interview-massing element and design data read in from external data files. This element then assembles the rooms on each floor of the building by placing consecutive instances of the room element.
Room Element	Calculates the requirements for each room from the room parameters passed to it by the core-massing or room-massing elements and design data read in from external room data files. This element then assembles the contents of the room in by placing instances of the lighting, electrical devices and furniture elements.
Stair Element	This element calculates the floor to floor stair requirements from data sent to it by the room element and sizes itself to fit the building.
Grouping Massing	This element assembles a group of instances in the appropriate locations from data read in from external data files. This element is typically placed by the room element to control the grouping of the contents of the room.
Door Element	This element calculates the opening requirements from data sent to it by the room element and sizes itself to fit the door opening.
Room Estimate	Placed by the core-massing or room-massing elements, this element is automatically passed quantity data by the room elements when they are executed. It then generates a graphical spreadsheet in the database, which displays the cost estimate data for the rooms.
Elevator Massing	Calculates the elevatoring requirements for the building from the building parameters passed to it by the interview-massing element and design data read in from external data files. This element then assembles the elevators on each floor of the building by placing consecutive instances of the elevator typical element and the elevator roof element.

Fig 29

Elevator Typical Element	This element calculates the typical floor to floor elevator requirements from data sent to it by the elevator massing element and sizes itself accordingly.
Elevator Roof Element	This element calculates the roof level elevator requirements from data sent to it by the elevator massing element and sizes itself accordingly.
Elevator Estimate	Placed by the elevator-massing element, this element is automatically passed quantity data by the elevator elements when they are executed. It then generates a graphical spreadsheet in the database, which displays the cost estimate data for the elevators.
Light Massing	Calculates the lighting requirements for each floor of the building from the building parameters passed to it by the interview-massing element and design data read in from external data files. This element then assembles the lights on each floor of the building by placing consecutive instances of the light element. Potential clashes between lights and other building components are automatically handled by functionality in this element checking the positioning of these elements and repositioning each light.
Light Element	Configures its self as the appropriate light fixture dependent on data passed to it by the light massing element. This element also routes its own circuit wiring to connect it to its neighbor in the circuit or to the light switch or appropriate junction box. It then calculates the types and quantities of wire and insulation used.
Lighting Estimate	Placed by the light-massing element, this element is automatically passed quantity data by the light elements when they are executed. It then generates a graphical spreadsheet in the database, which displays the cost estimate data for the lights and wiring.
Building Shape Element	Determines the building configuration and floor plate area. Allows adjustment of various variables that make up the building perimeter. Calculates the perimeter points and sends this information to the grid/dimension element to calculate the grid layout then the structure element is called to calculate the structural components and estimate.
Grid/Dimension Element	Calculates the grid layout dimensions for the building configuration.
Structure Element	Receives the building layout and grid locations from above elements then calculates all pier, column, beam and joist locations. Accumulates all quantities and develops an estimate for the structure.
Pier Cap/Grade Beam Element	Calculate the location and sizes for the pier caps and grade beams.
Electrical Massing	Calculates the electrical service requirements for each floor of the building from the parameters passed to it by the interview-massing element and design data read in from external data files. This element then assembles electrical service equipment and wiring on each floor of the building by placing consecutive instances of the electrical device element. It can also generate a graphical spreadsheet in the database, which displays the high and low voltage electrical service panel circuit breaker diagrams.
Electrical Device Element	Configures its self as the appropriate electrical equipment or device dependent on data passed to it by the electrical massing element. This element also routes its own circuit wiring to connect it to its neighbor in the circuit or to the appropriate junction box. It then calculates the types and quantities of wire and insulation used.
Electrical Estimate	Placed by the electrical-massing element, this element is automatically passed quantity data by the electrical device elements when they are executed. It then generates a graphical spreadsheet in the database, which displays the cost estimate data for the electrical devices, equipment and wiring.
HVAC Massing	Receives the building configuration from the building shape element then calls the HVAC Area element to calculate all zone areas. Then passes these areas to the peaks element which calls the tables element and the floor and building peak loads are calculated. This element then places instances of the exterior, interior and corner VAV elements, which calculate the VAV box and Duct sizes.
HVAC Exterior VAV Element	Calculates the exterior VAV box, duct and diffuser sizes for the perimeter zones.
HVAC Interior VAV Element	Calculates the interior VAV box, duct and diffuser sizes.
HVAC Corner VAV Element	Calculates the corner VAV box, duct and diffuser sizes for the perimeter zones.
HVAC Area Element	Receives the building perimeters from the HVAC massing element, breaks the building up into interior, exterior and corner zones then calculates the floor square footage for each zone.
HVAC Peaks Element	Receives the ASHRAE cooling and heating load tables from the tables element and the zone areas from the area element and calculates the building and floor peak load design criteria.
HVAC Tables Element	Receives the longitude, latitude and other pertinent information about the building location and creates cooling load, solar gain and factor tables to be used to calculate the design building loads.
HVAC Estimate	Placed by the HVAC-massing element, this element is automatically passed quantity data by the HVAC elements when they are executed. It then generates a graphical spreadsheet in the database, which displays the cost estimate data for the HVAC system.

Fig. 2h

Site Massing	Calculates the site requirements for the building from the building parameters passed to it by the interview-massing element and design data read in from external data files. This element then assembles the site layout around the building by placing applicable instances of the site element.
Site Element	Designs the individual site elements from design parameters passed to it by the site-massing element. This element also calculates an accurate set of quantities for materials and components used to assemble the site layout.
Site Estimate	Placed by the site-massing element, this element is automatically passed quantity data by the site elements when they are executed. It then generates a graphical spreadsheet in the database, which displays the cost estimate data for the site layout.
Quantities Element	Placed by the interview-massing element, this element calculates additional required building components not covered by the individual estimate elements listed above. Applicable building information is passed by the interview-massing element when it is executed. It then generates a graphical spreadsheet in the database, which displays the cost estimate data for the additional building components. It also passes its quantity data directly to the interview estimate element.

Fig 21

Fig. 3

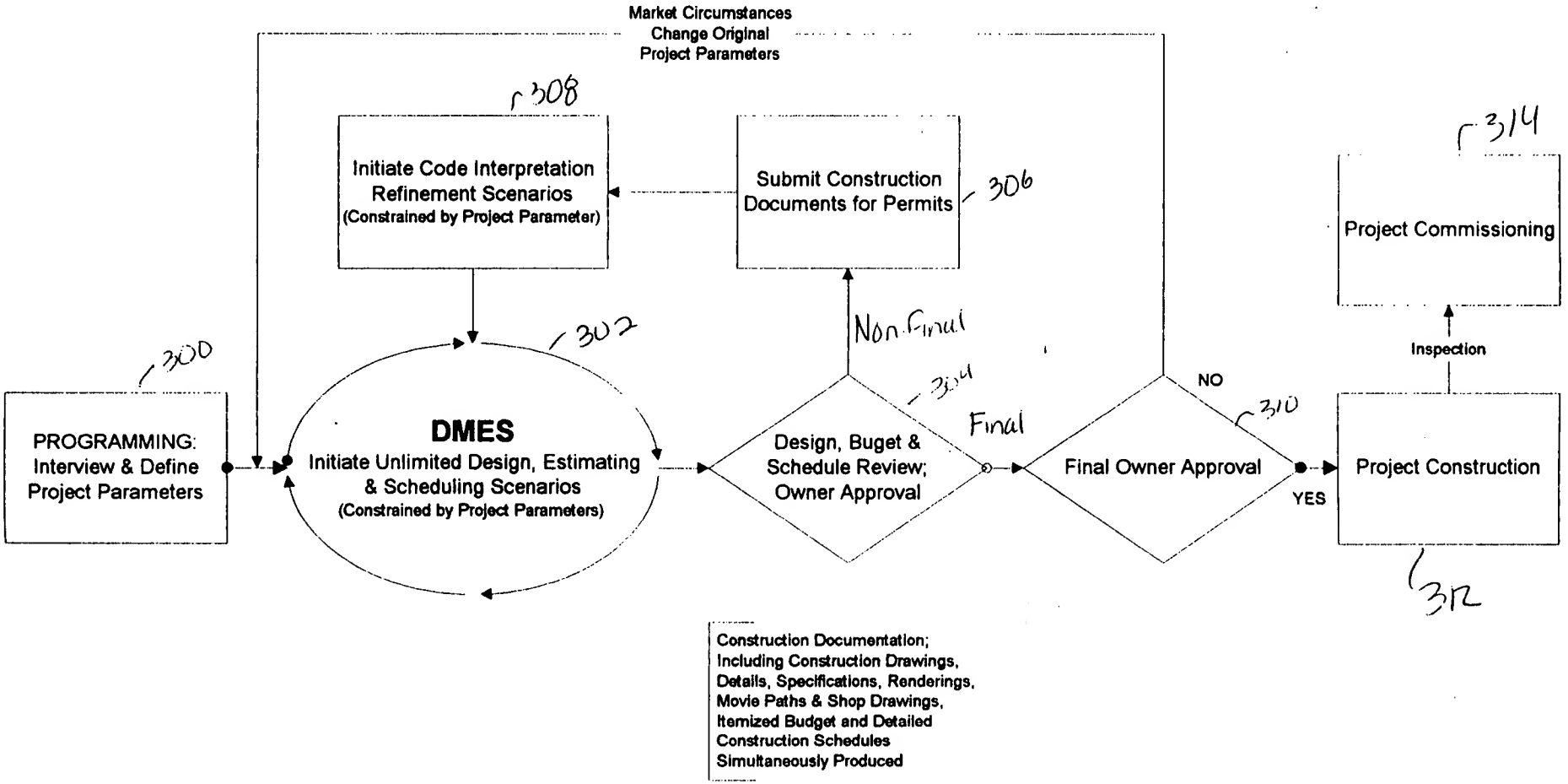

Figure 4a

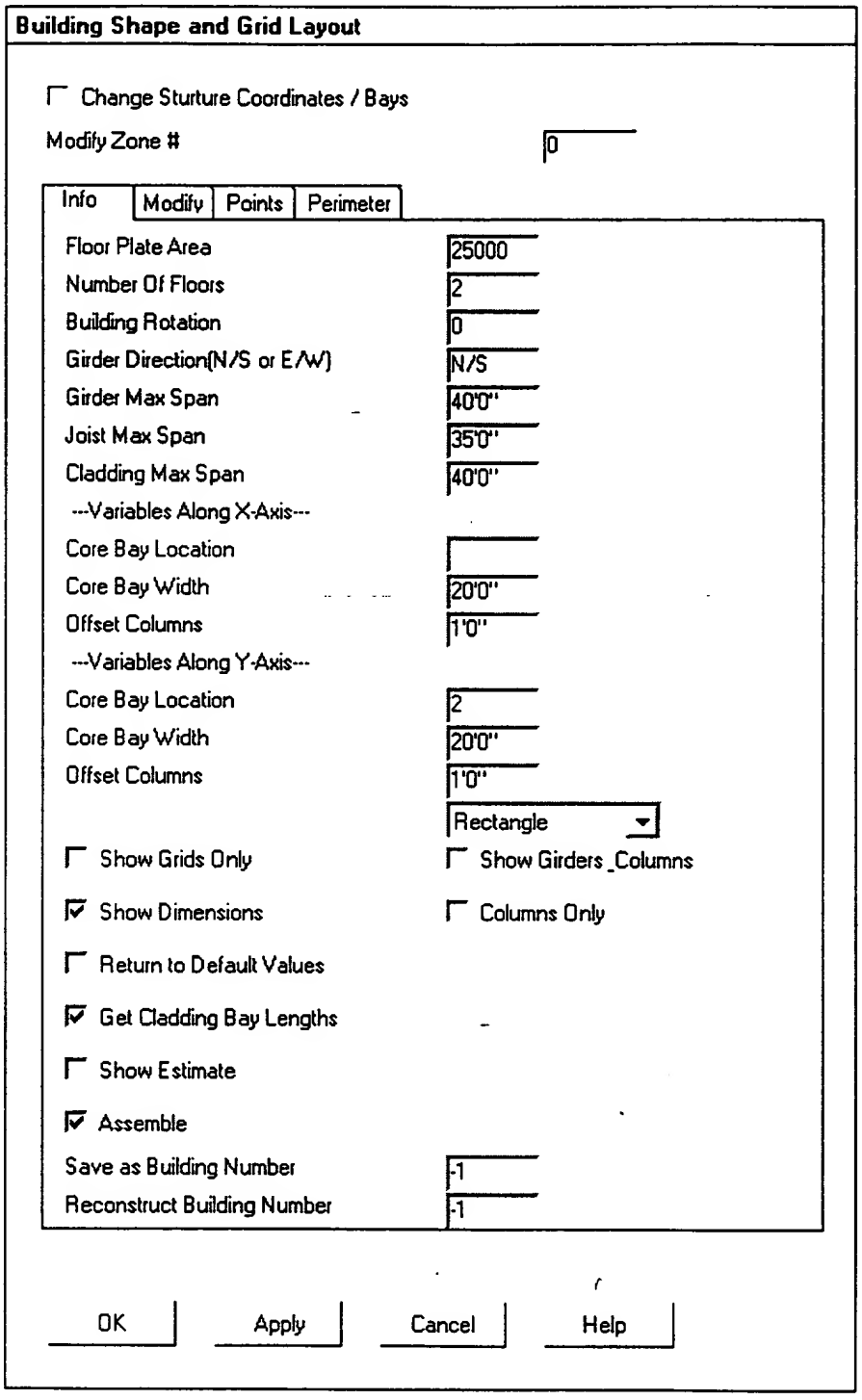

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Figure 4b

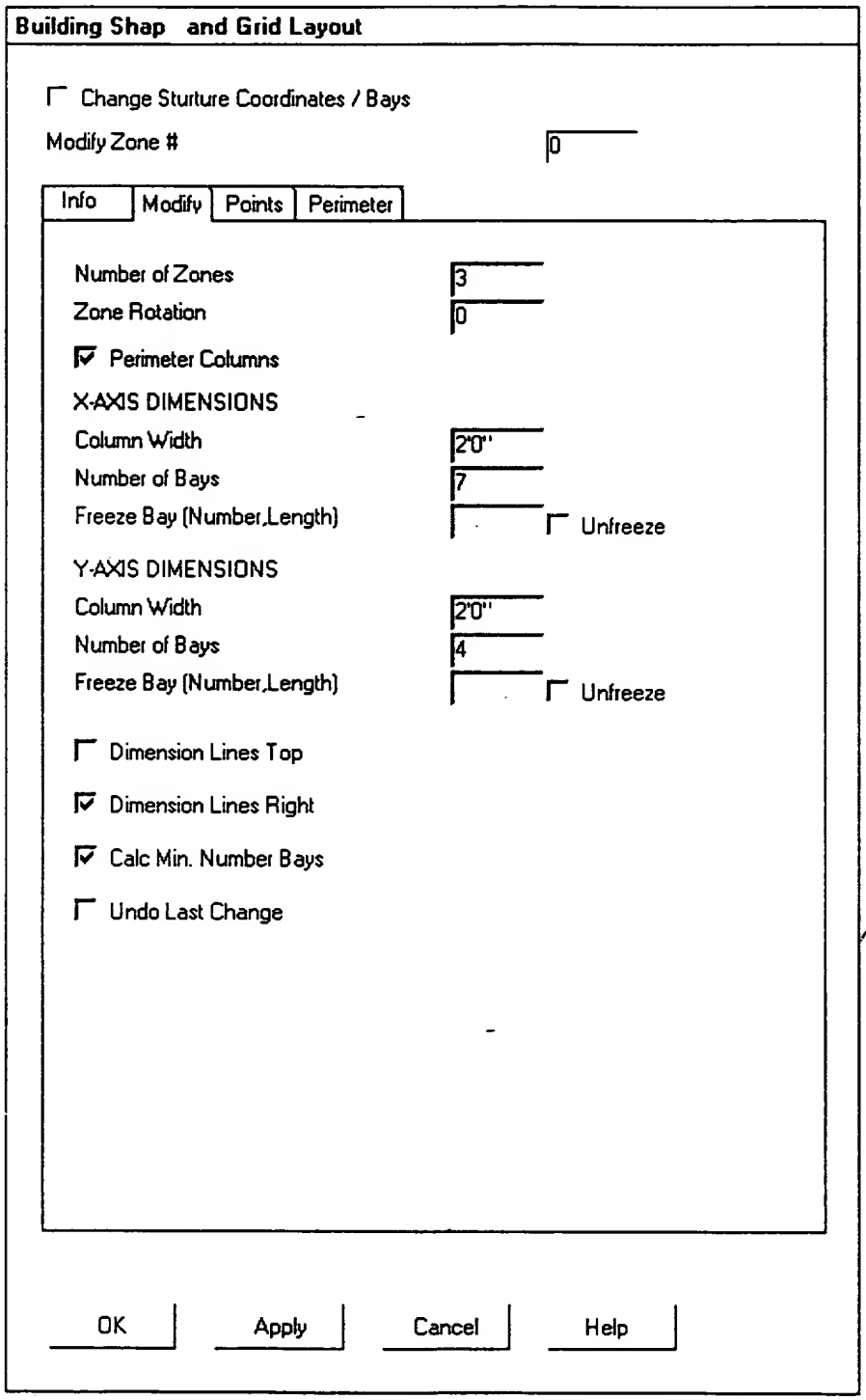

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Figure 4c

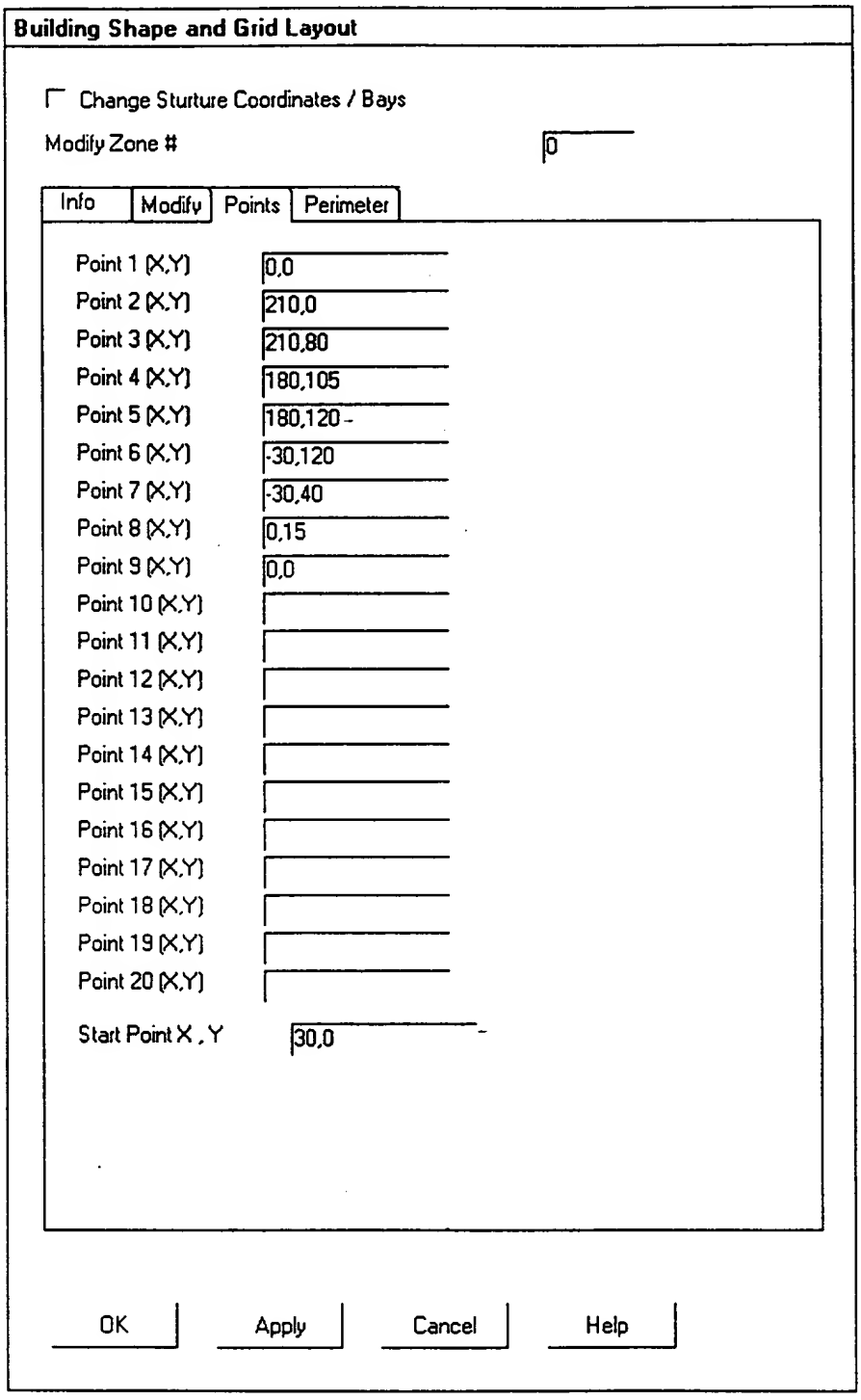

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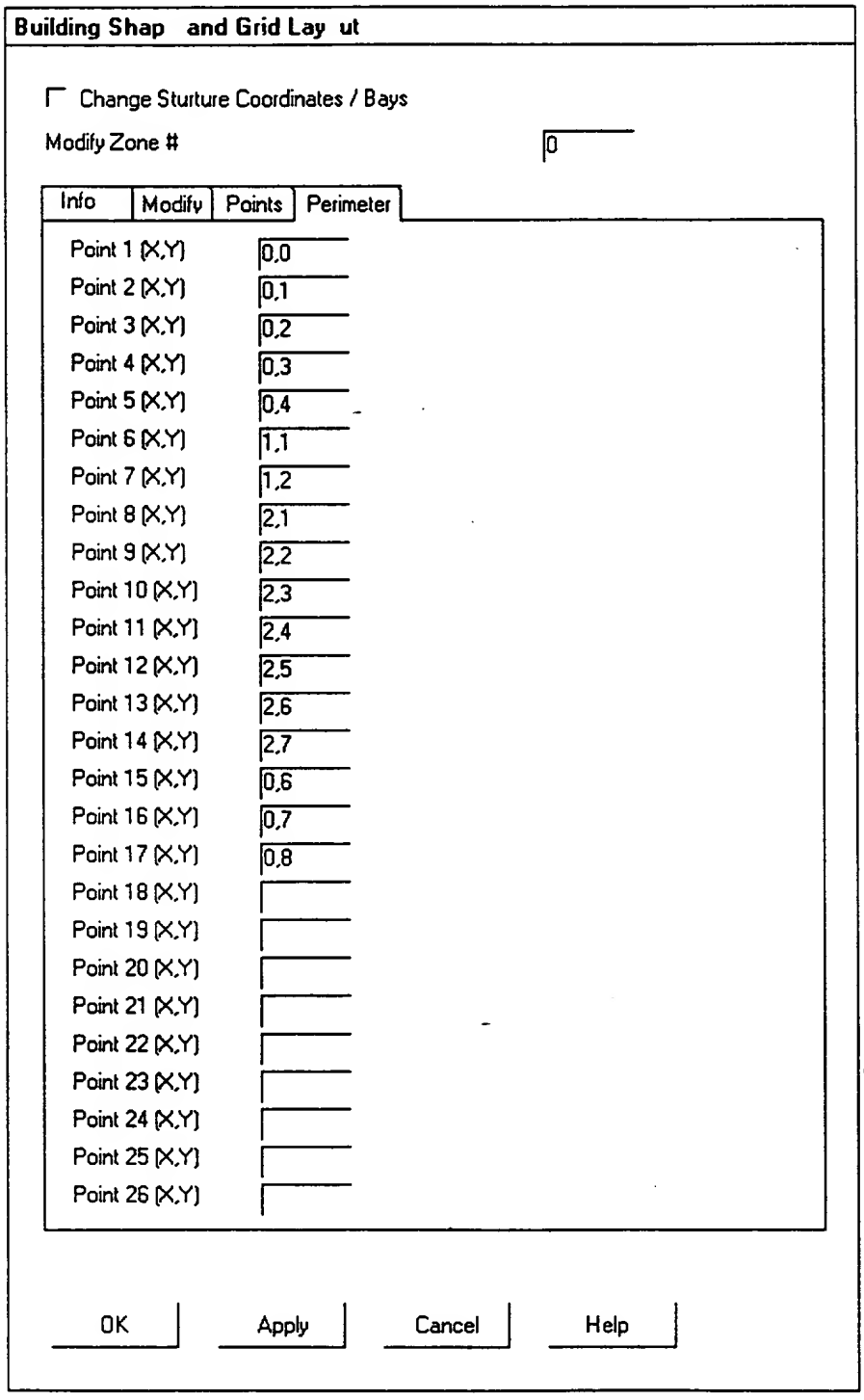
Figure 4d



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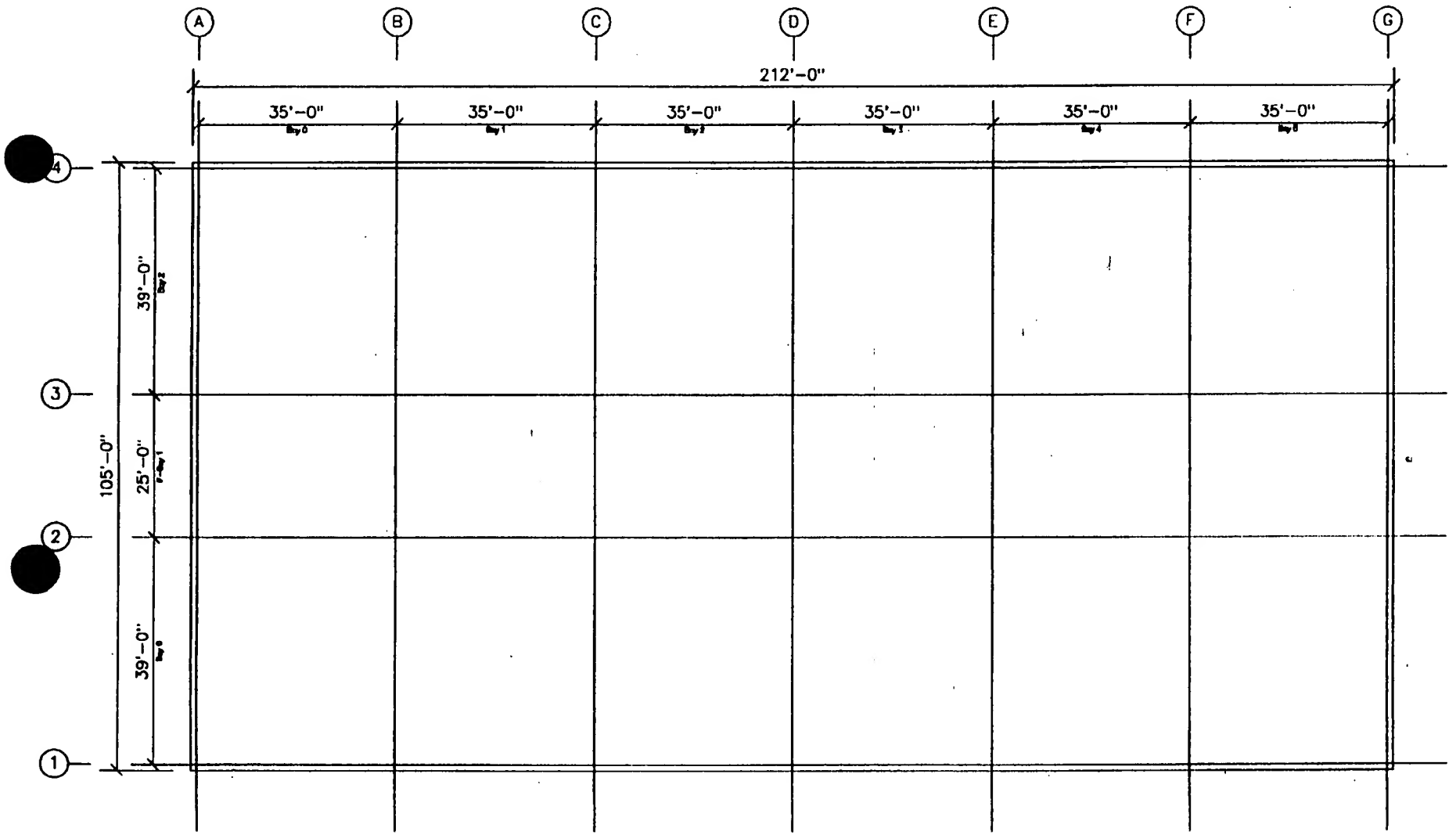

Fig. 4e

Figure 4f

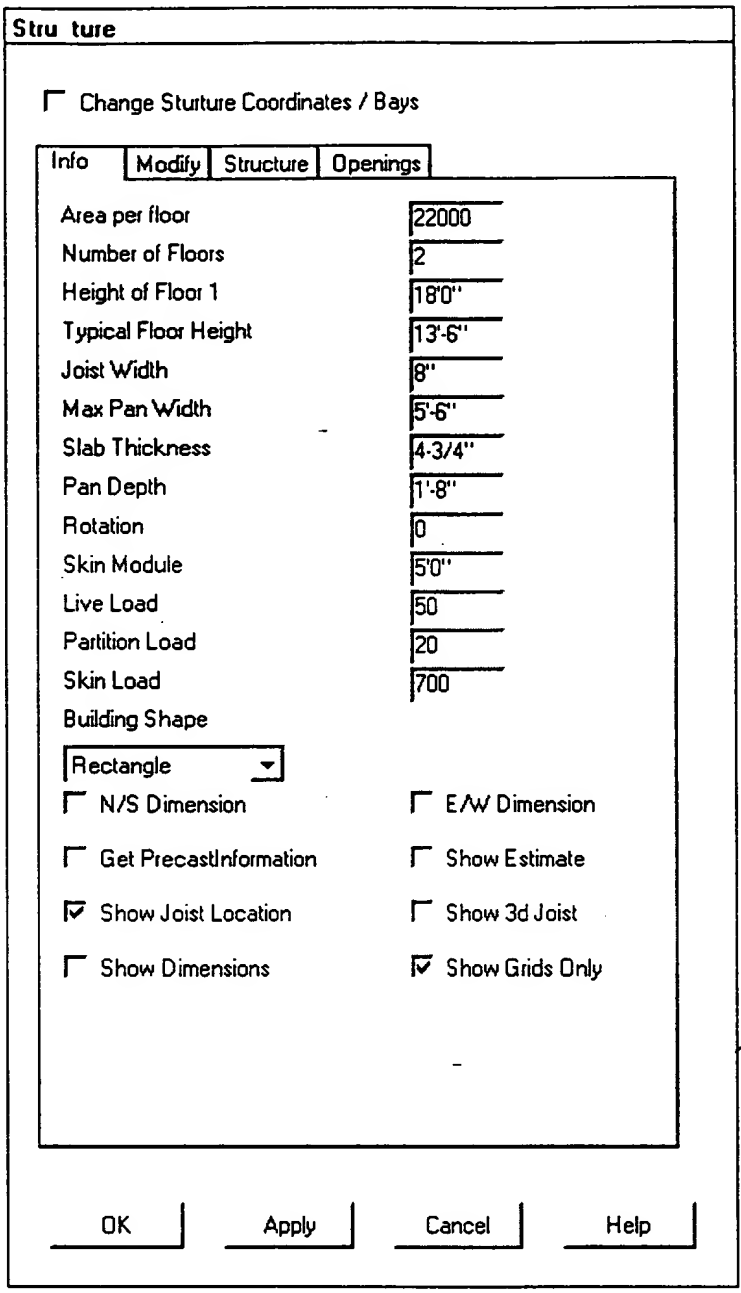

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Figure 4g

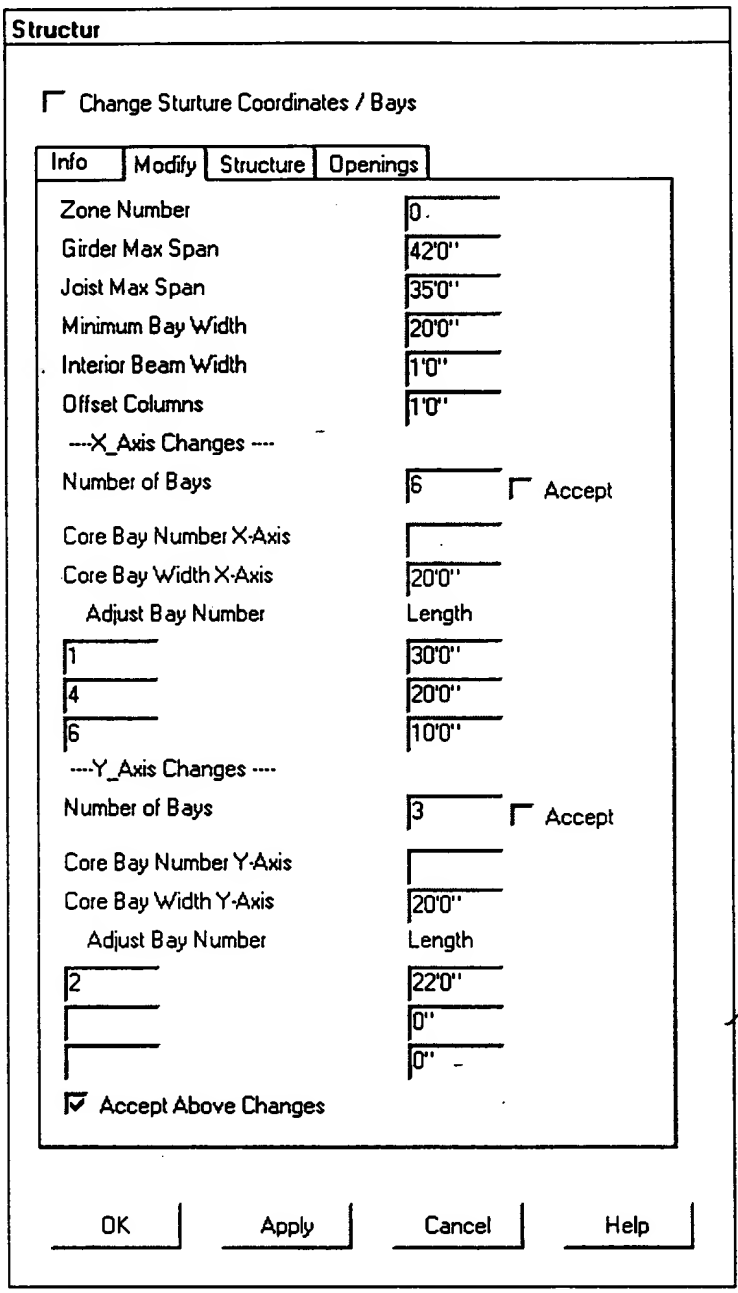

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Figure 4h

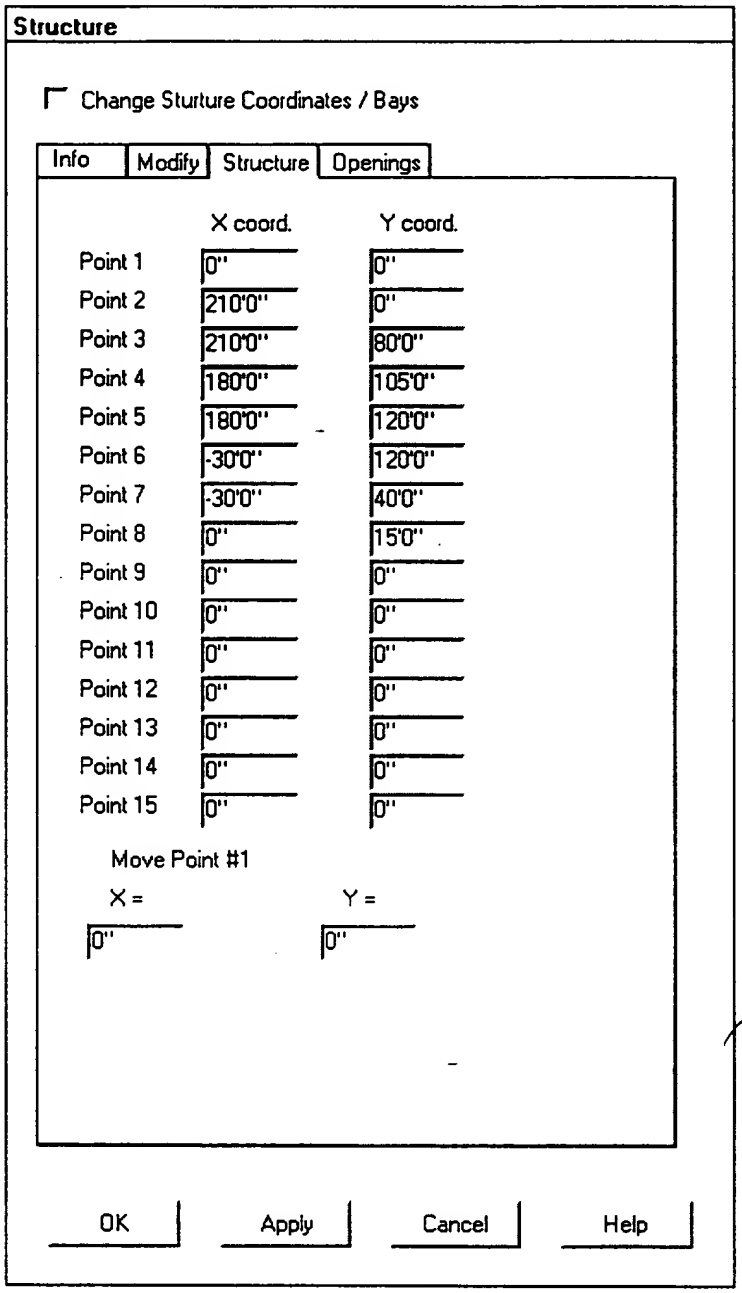

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Figure 4i

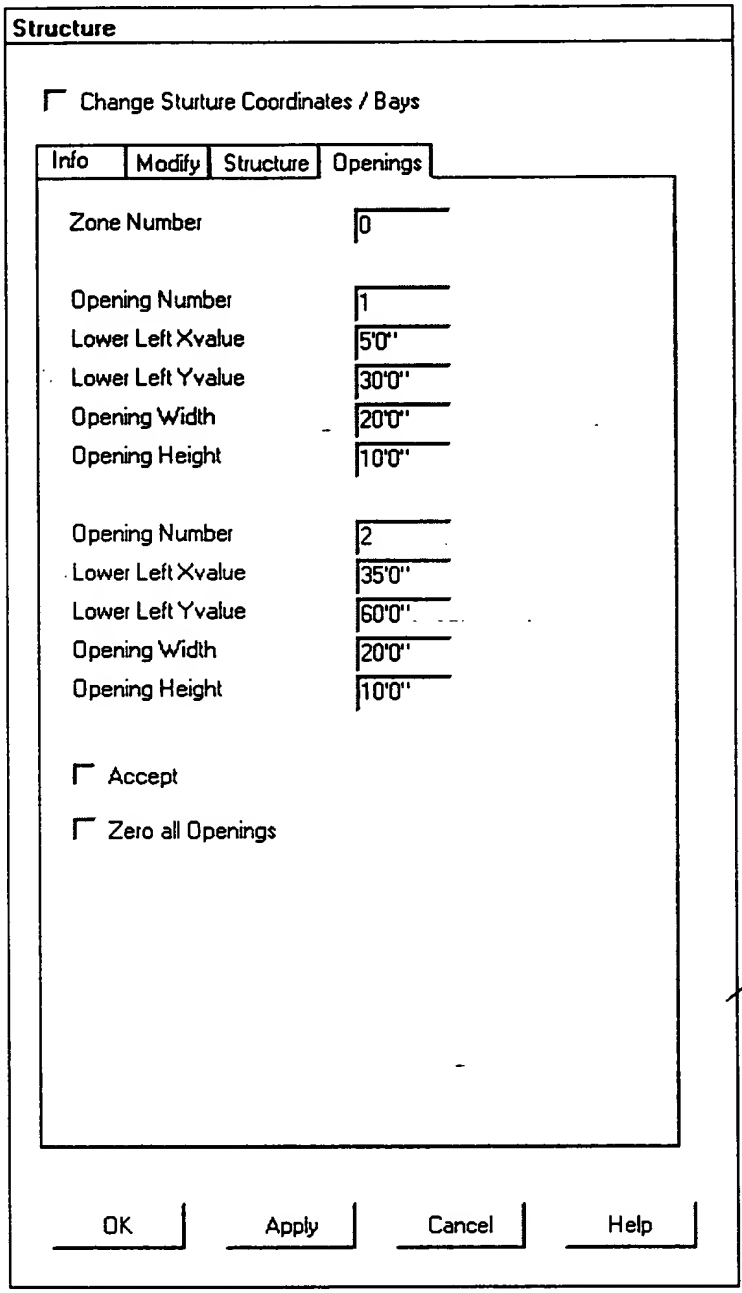

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Figure 4j

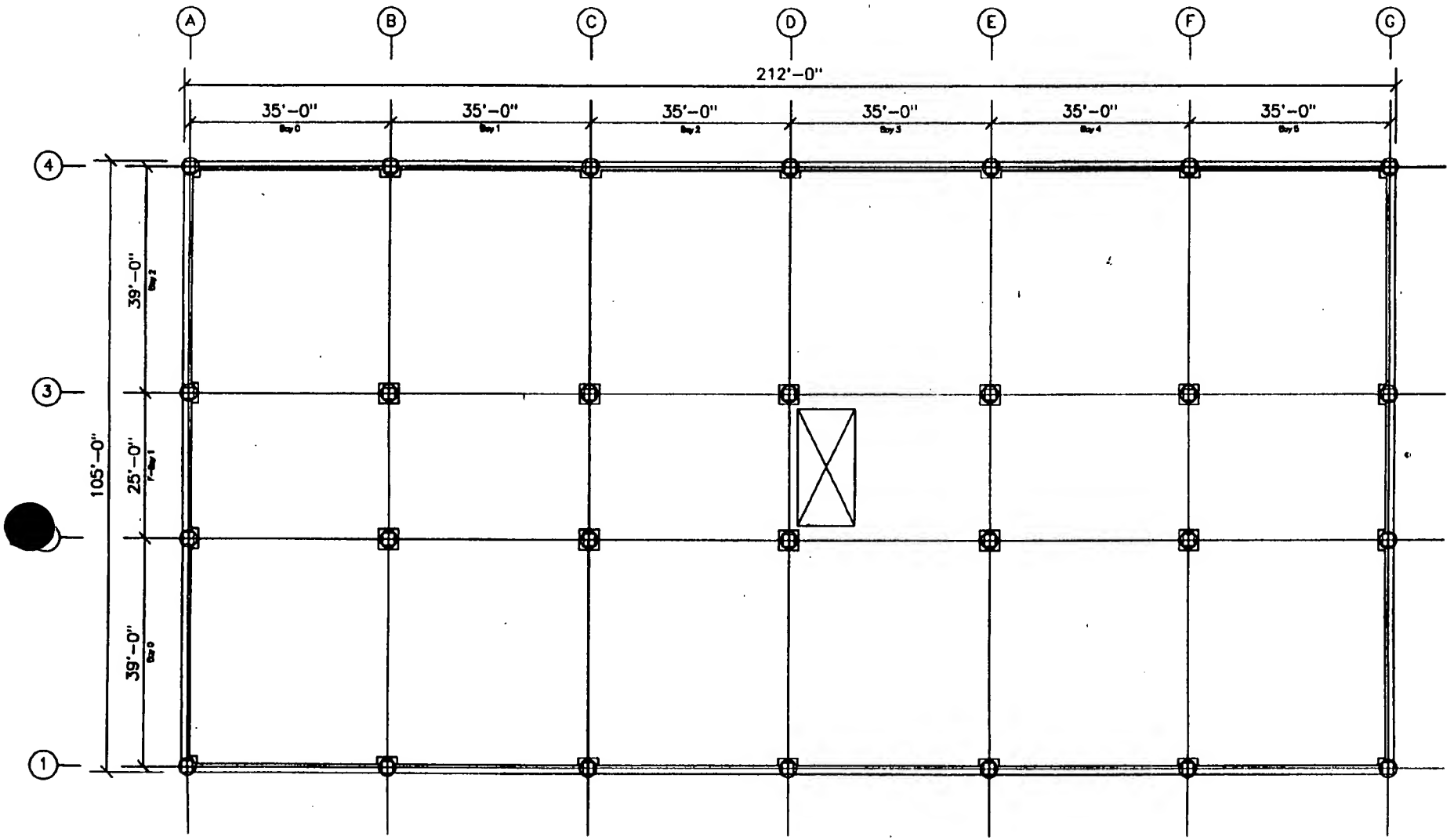
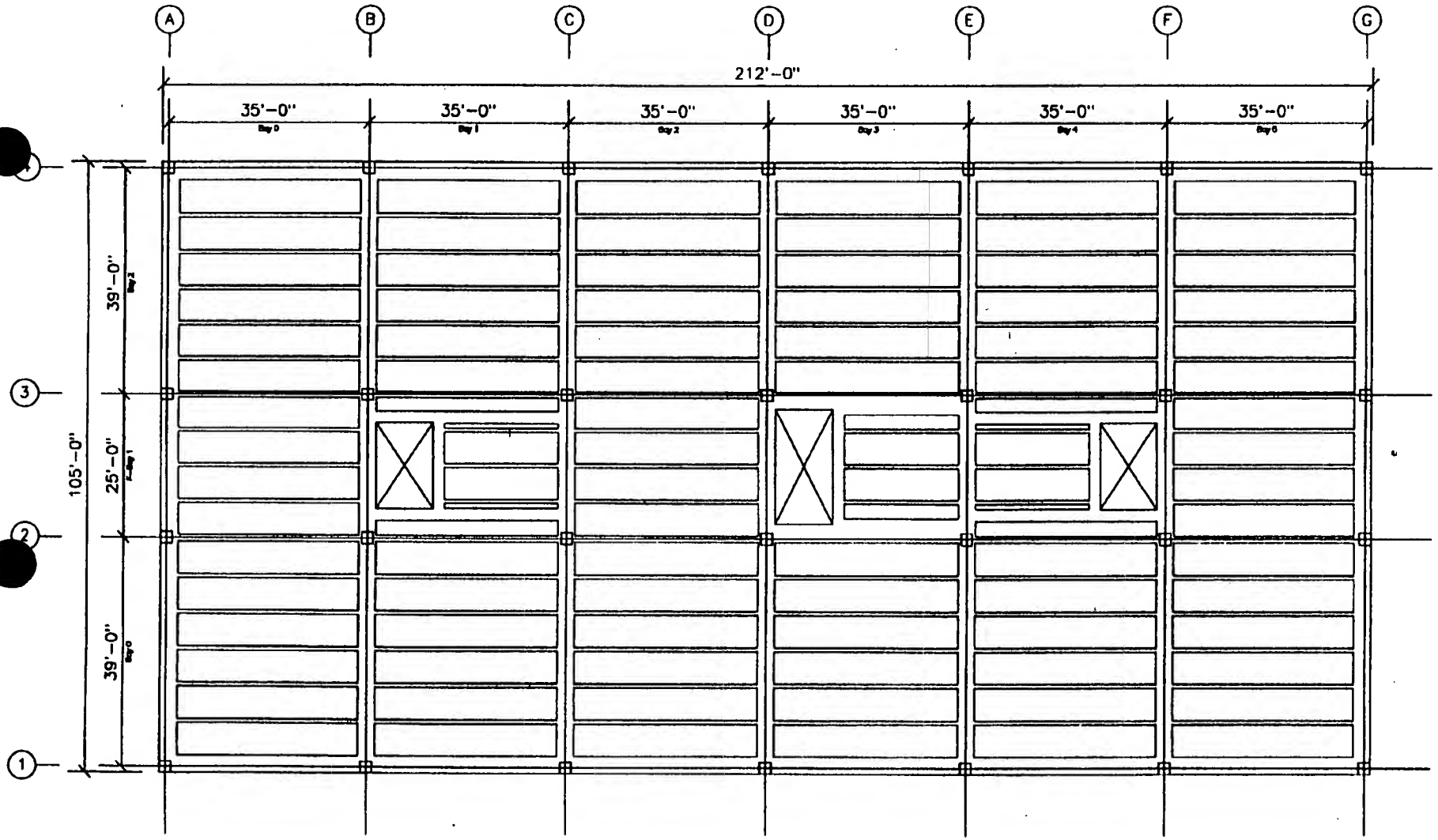


Figure 4k



Specific Design Process
Figure 4l

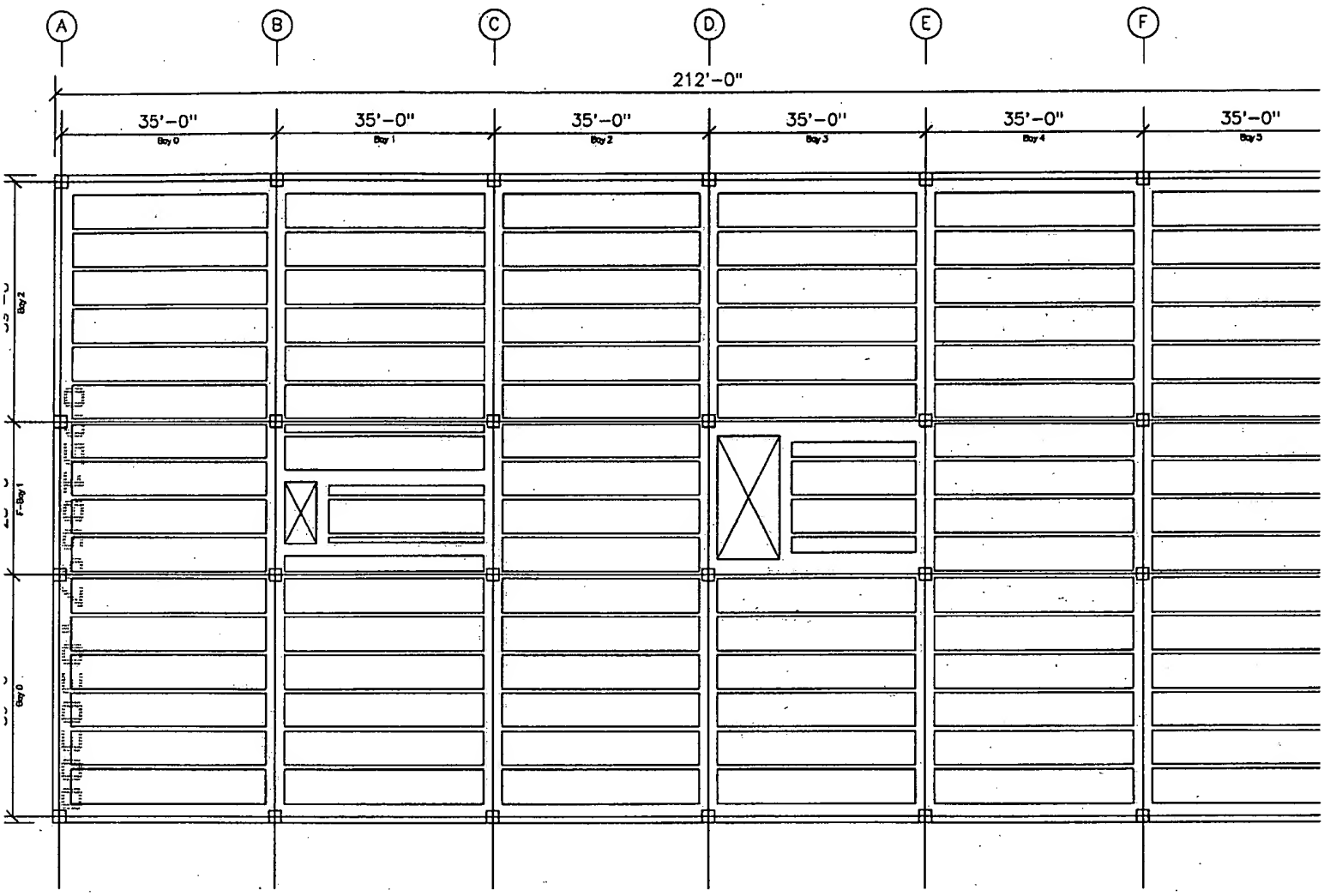
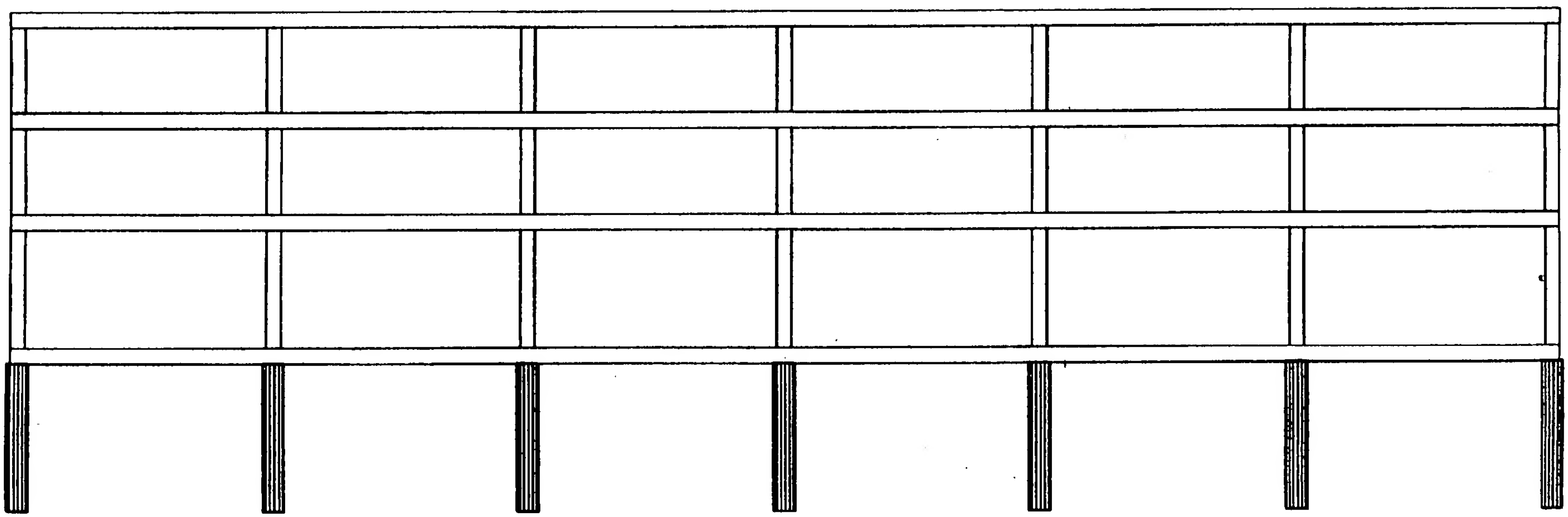


Figure 4m



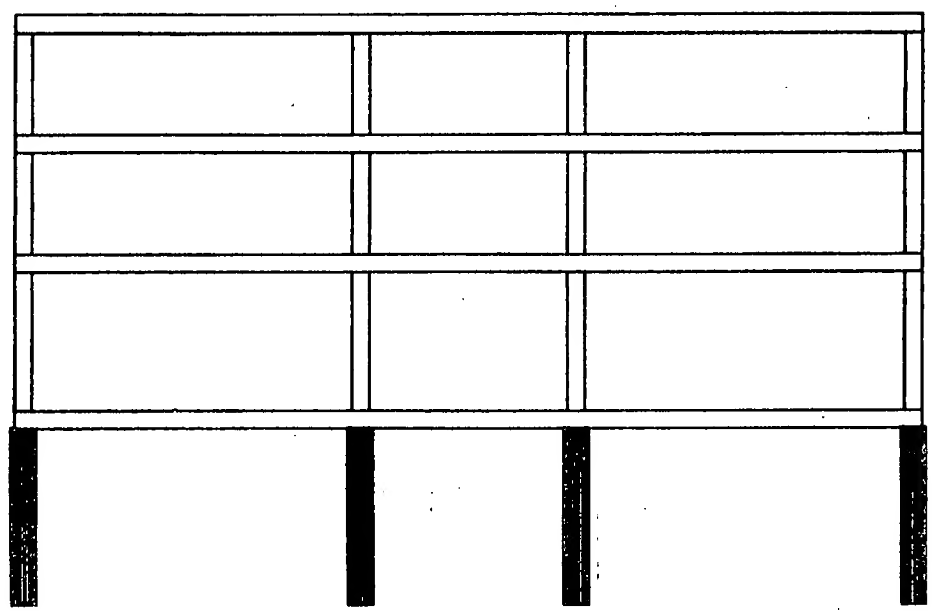
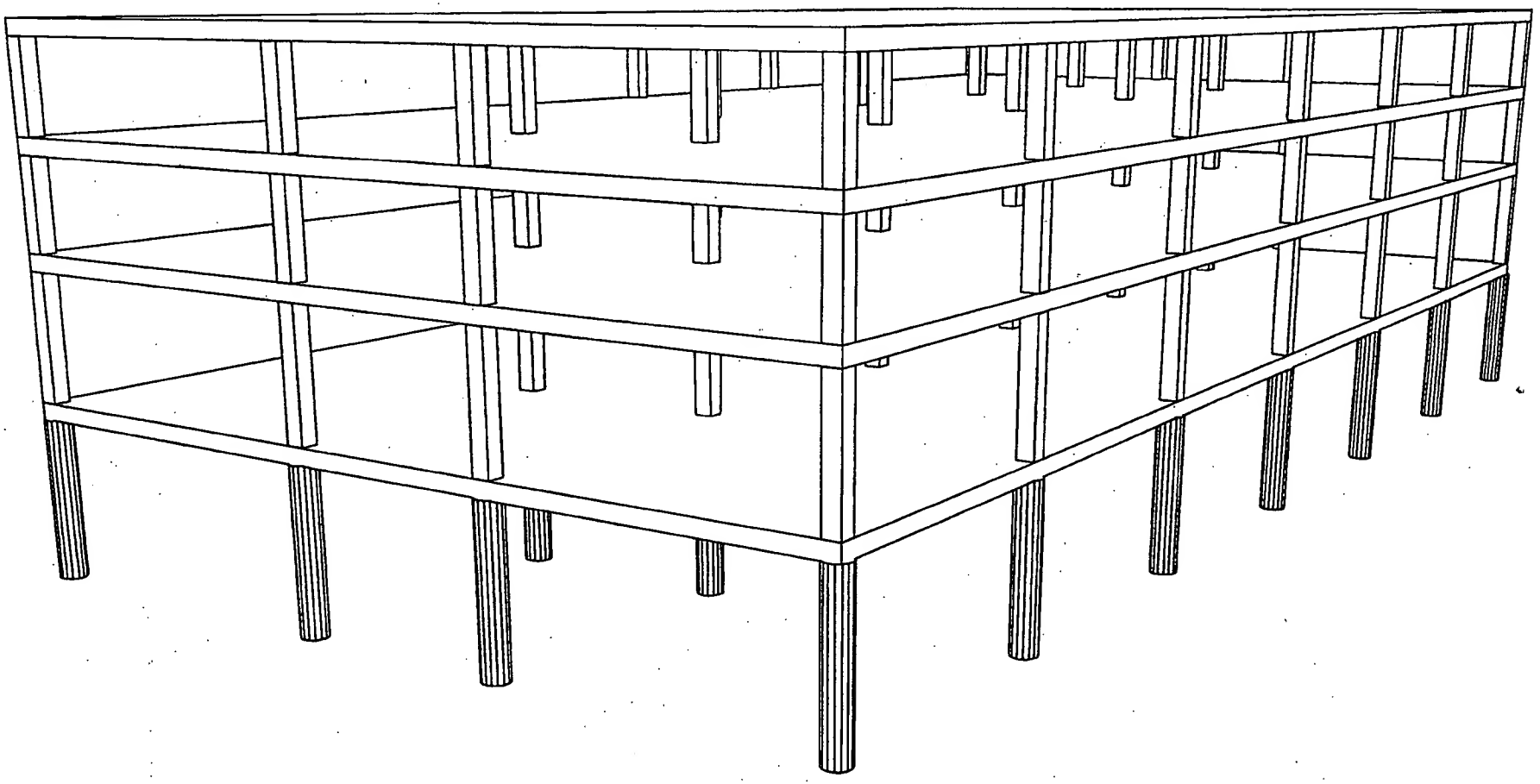


Fig. 4n

Figure 40



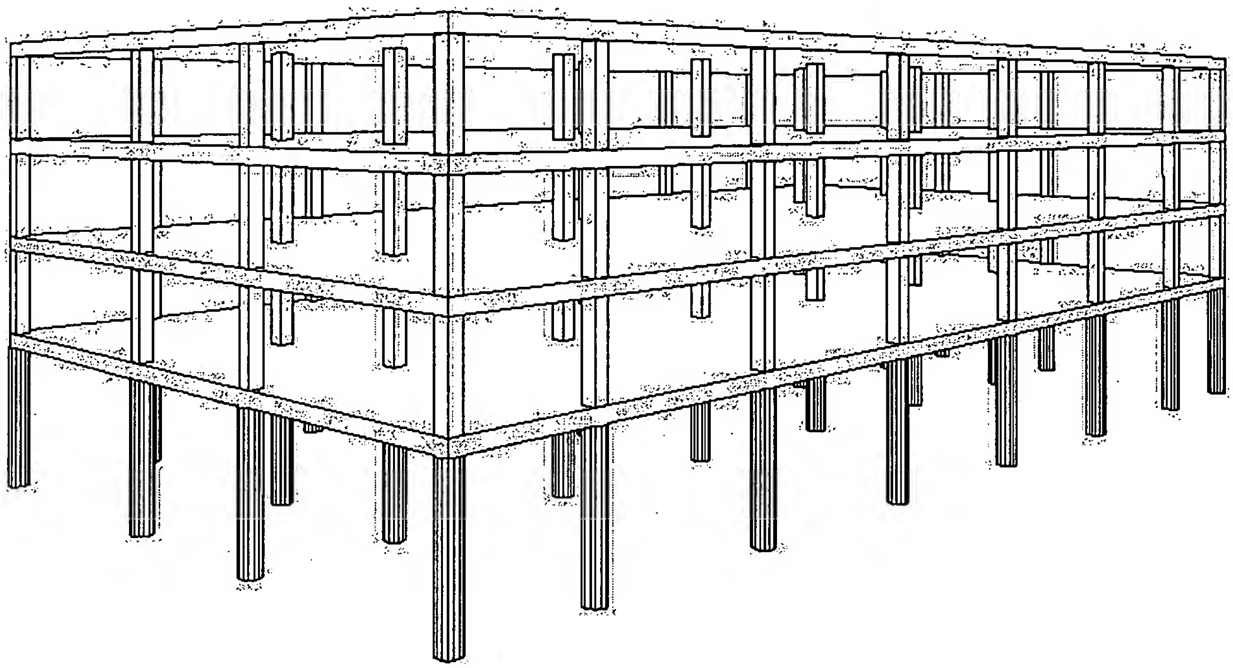


Fig. 5a

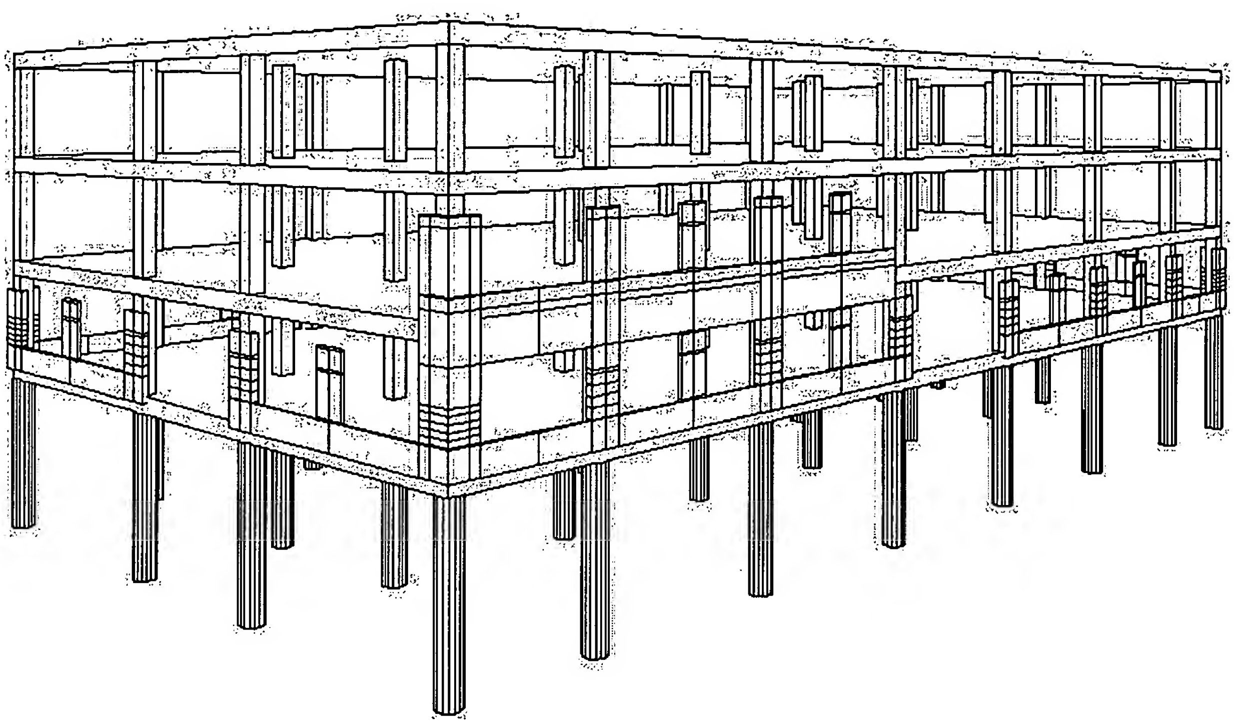


Fig.5b

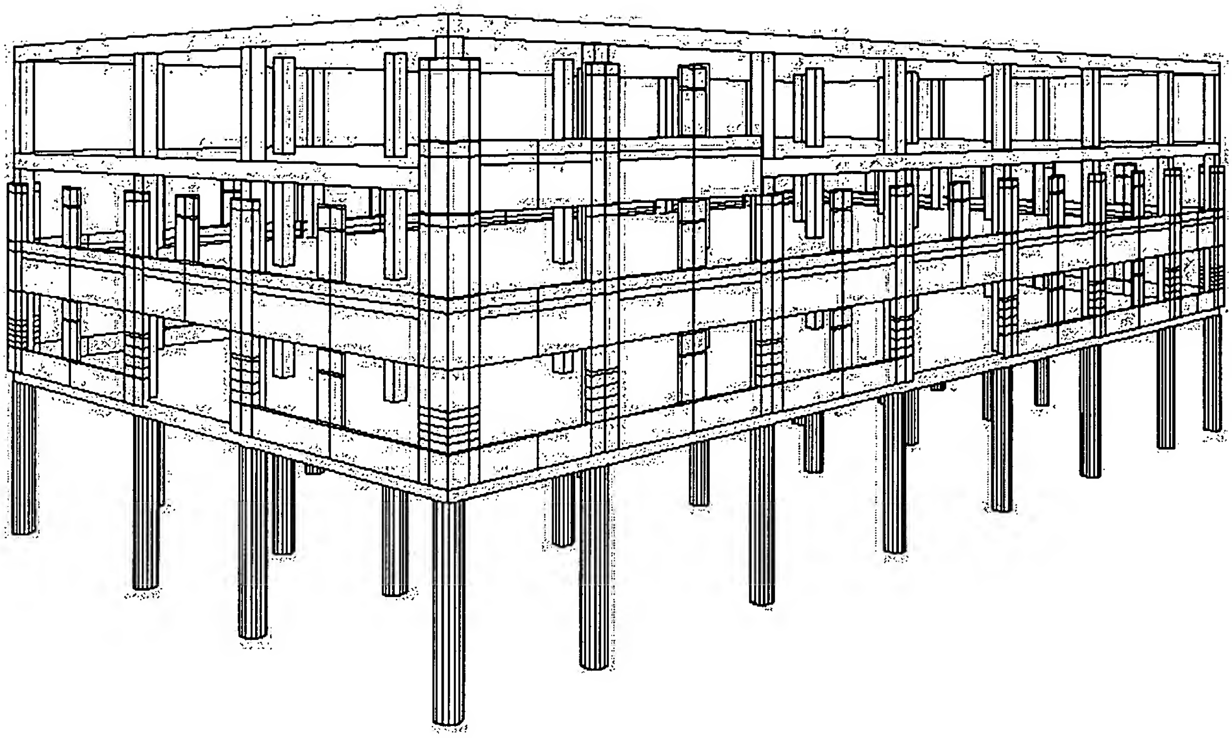


Fig.5c

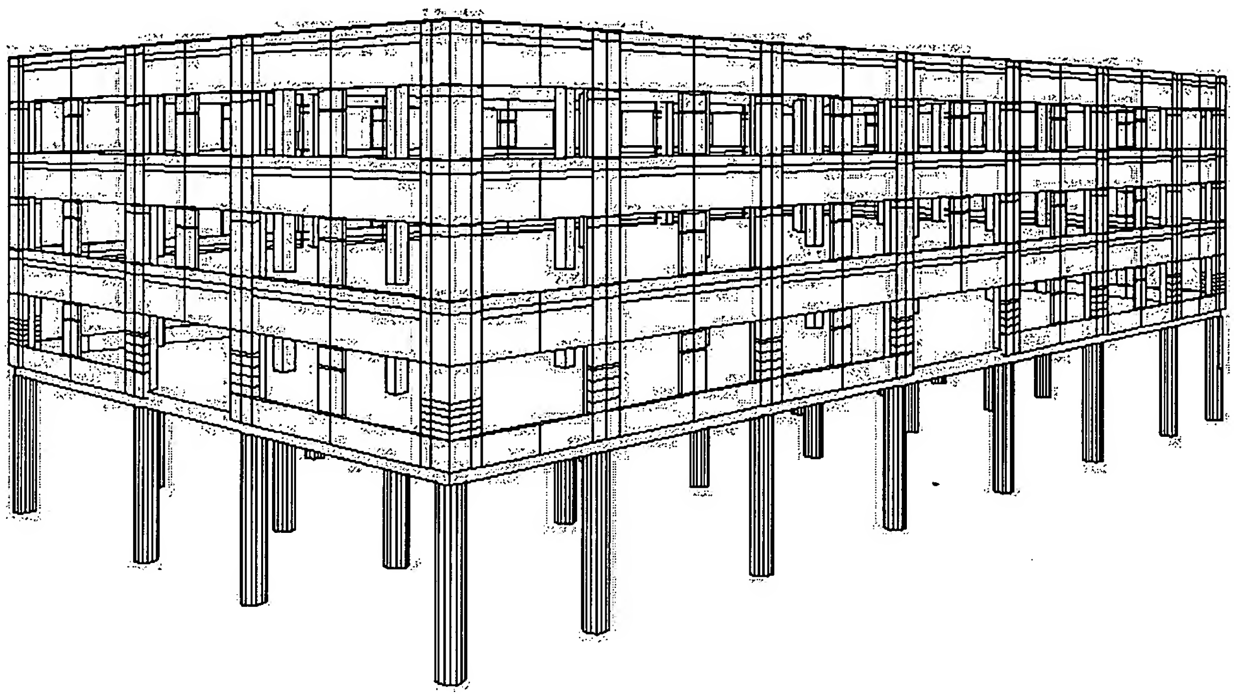


Fig.5d

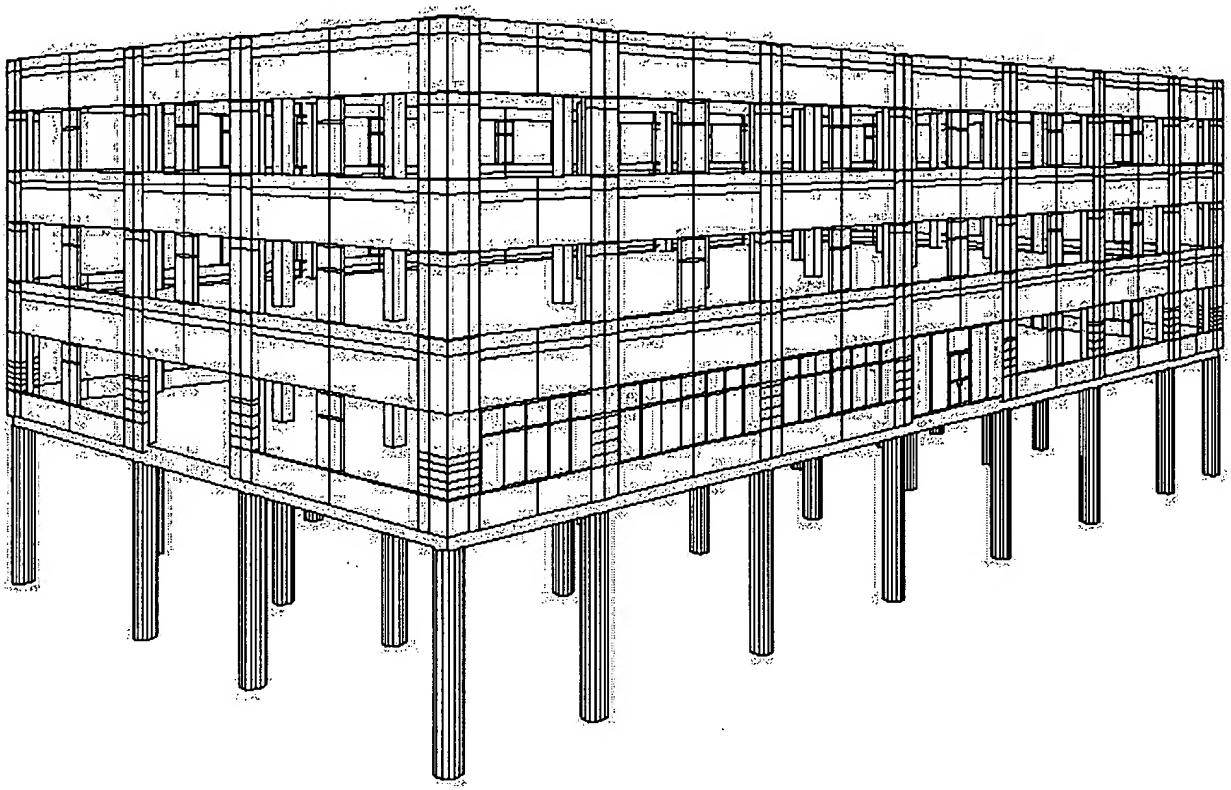


Fig. 5e

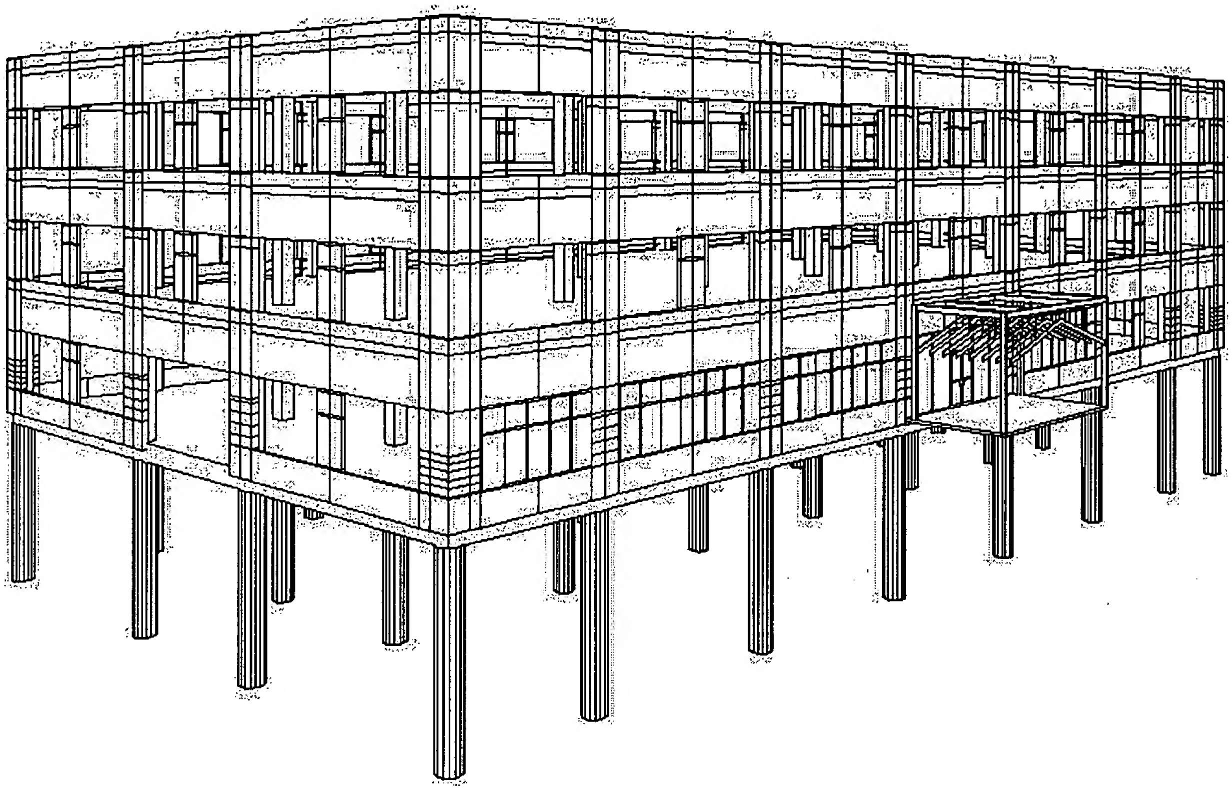


Fig. 5A

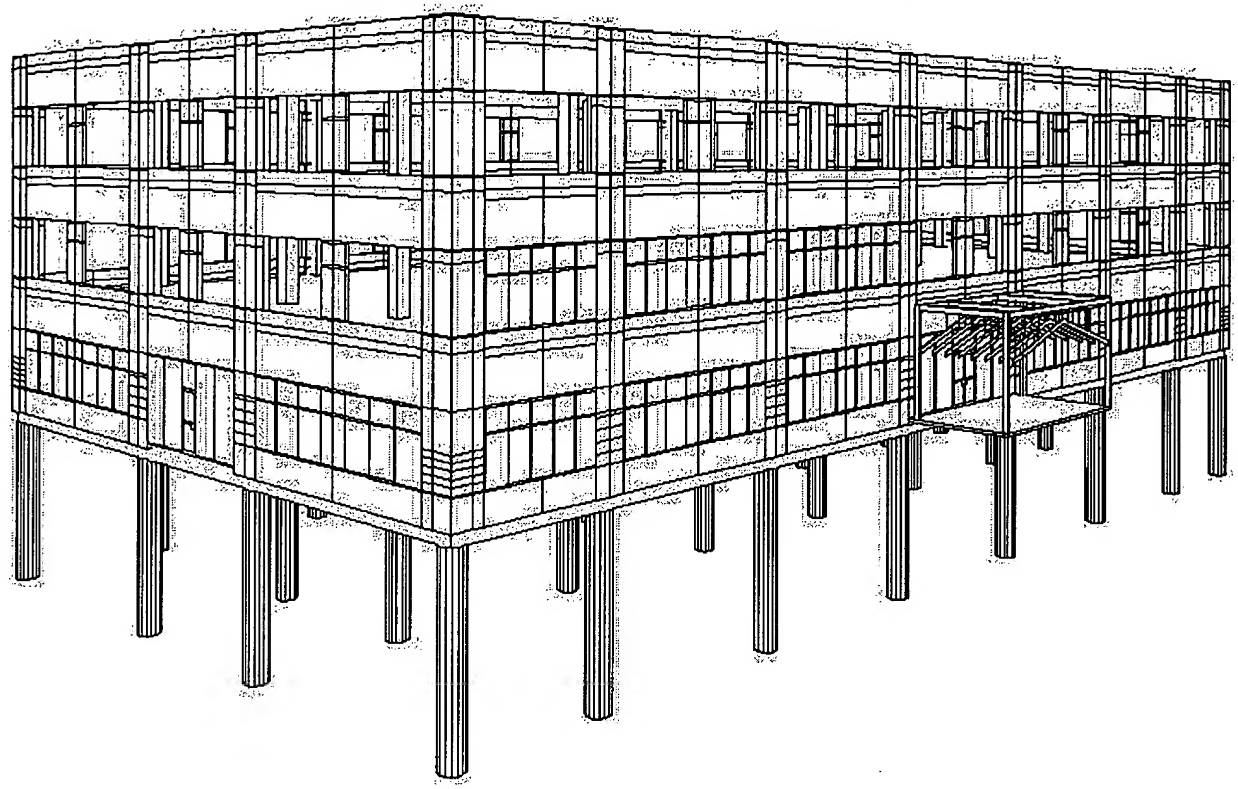


Fig. 5g

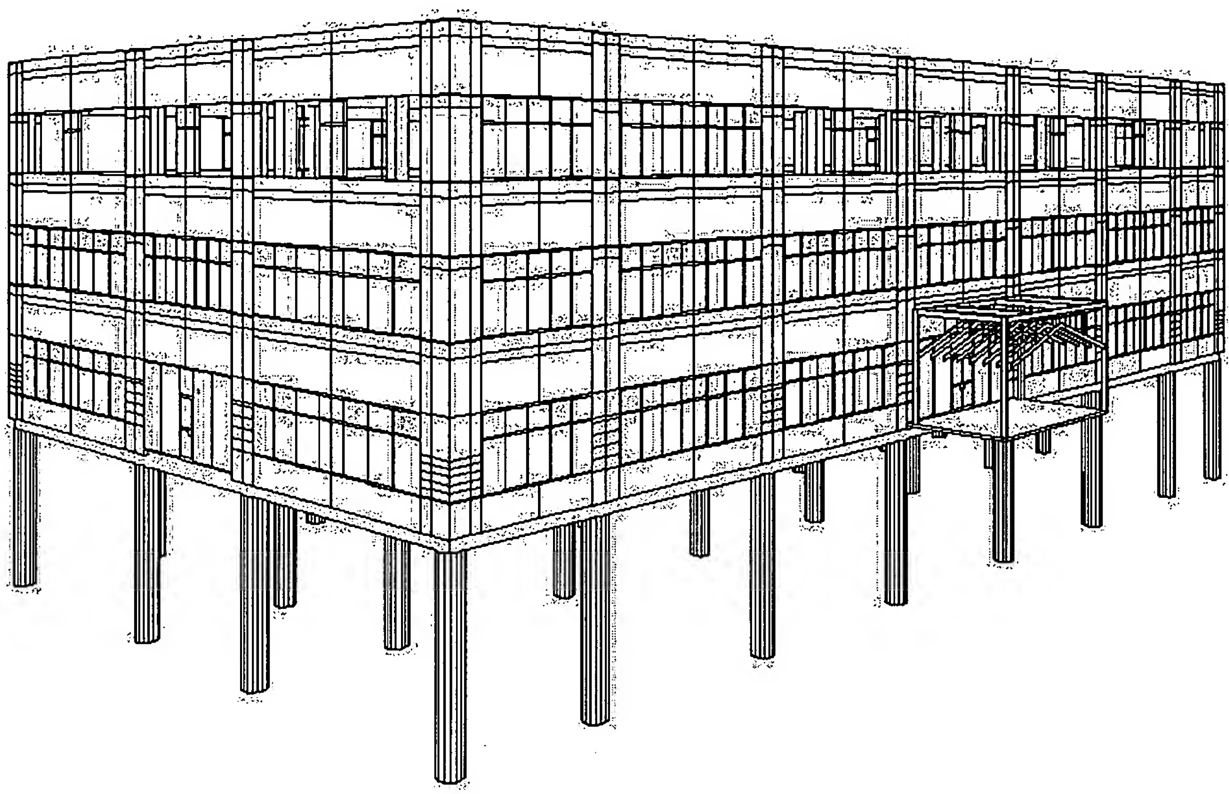


Fig. 5h

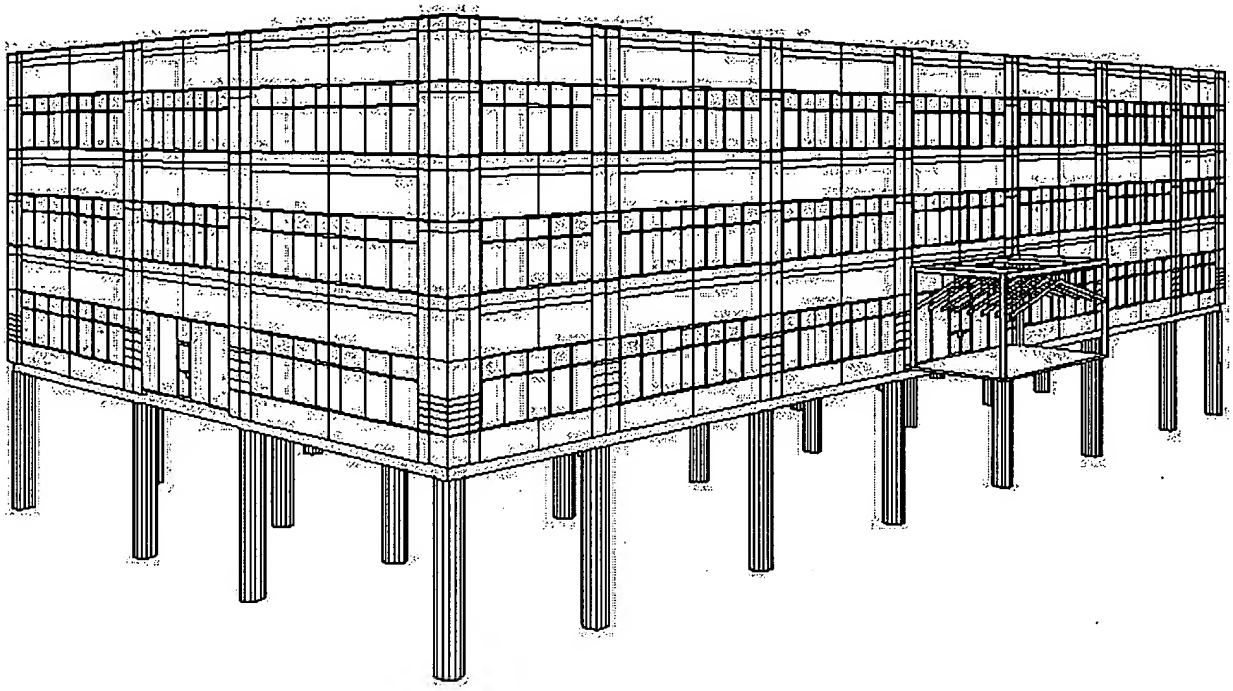


Fig. 5i

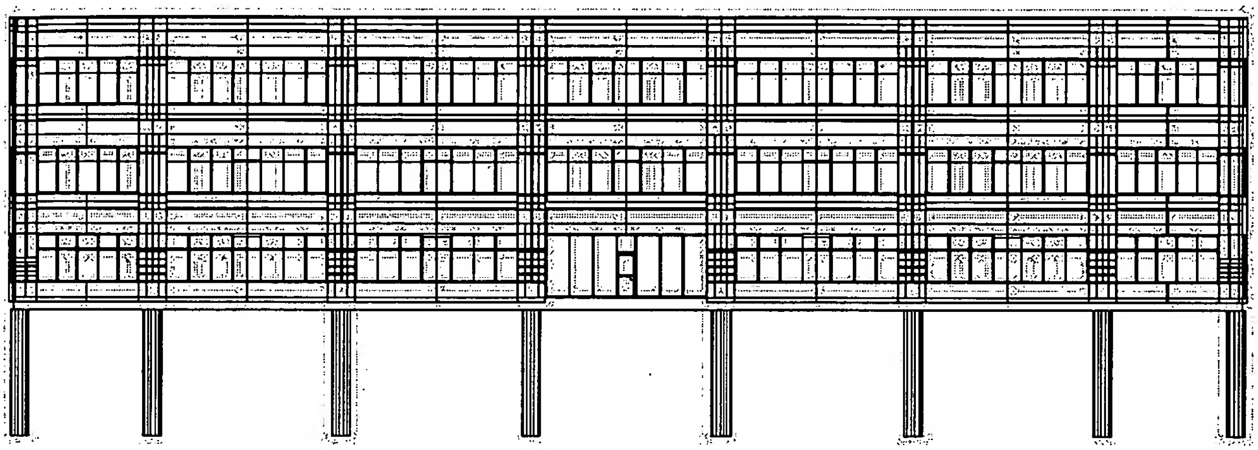


Fig. 5j

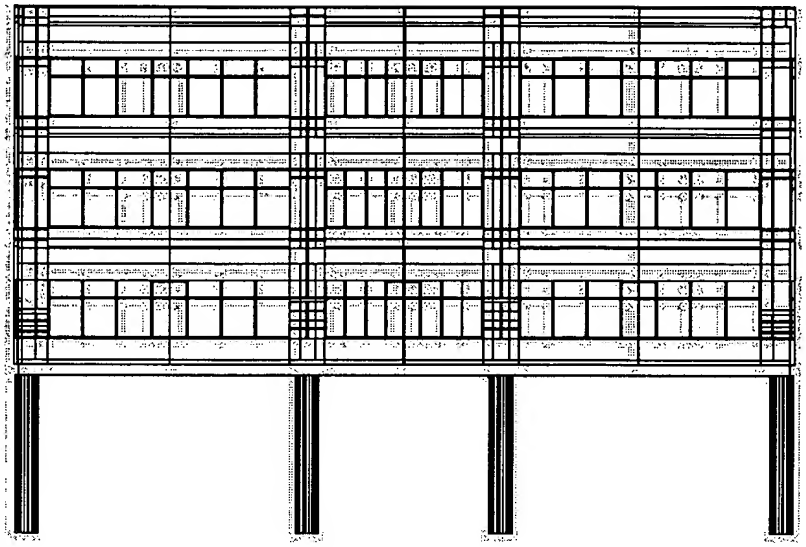


Fig. 5K

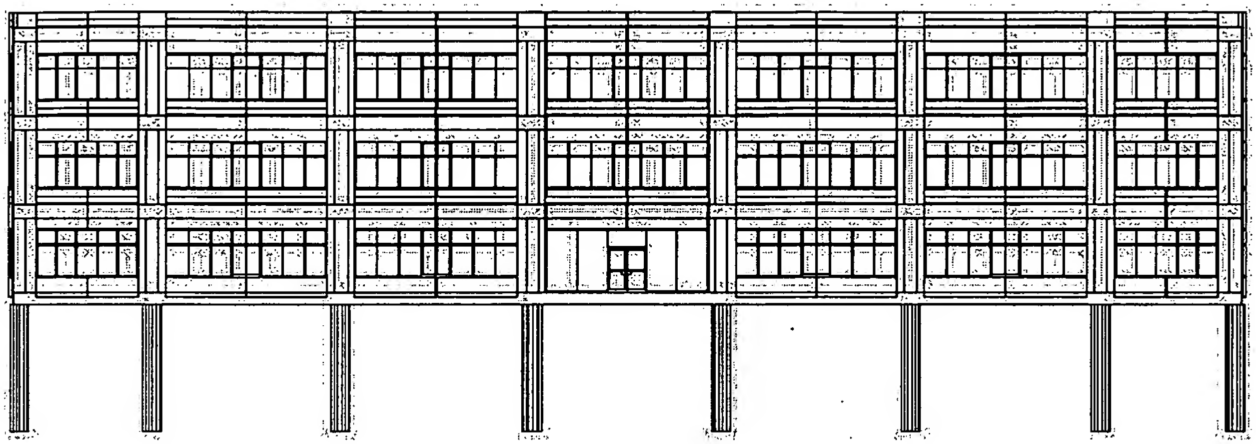


Fig. 51

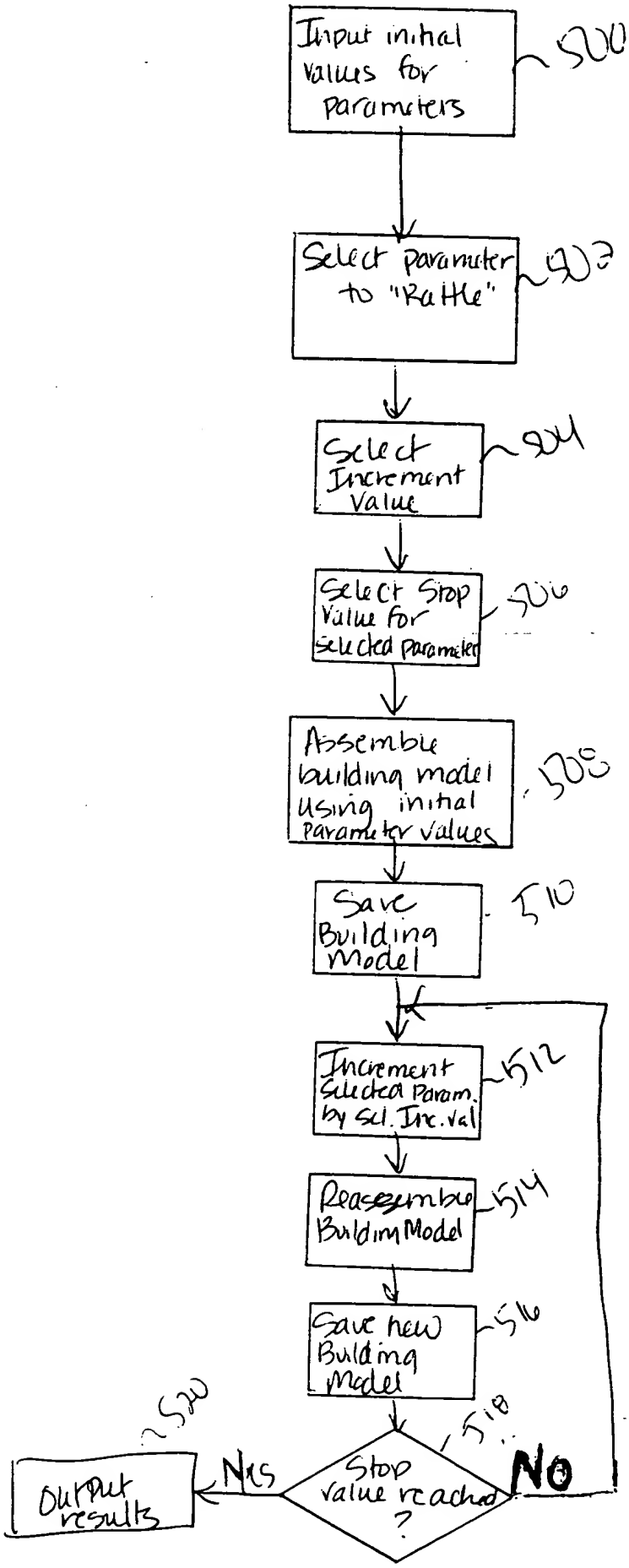

Input initial values for parameters
500
Select parameter to "Rattle"
502
Select Increment Value
504
Select Stop Value for selected parameter
506
Assemble building model using initial parameter values
508
Save Building Model
510
Increment Selected Param. by sel. Inc. val
512
Reassemble Buildin Model
514
Save new Buildin Model
516
Stop value reached ?
518
No
Yes
Output results
520

Fig. 6a

"Rattle the Box"

Rotate Building on Site by 10 Degrees Each Pass

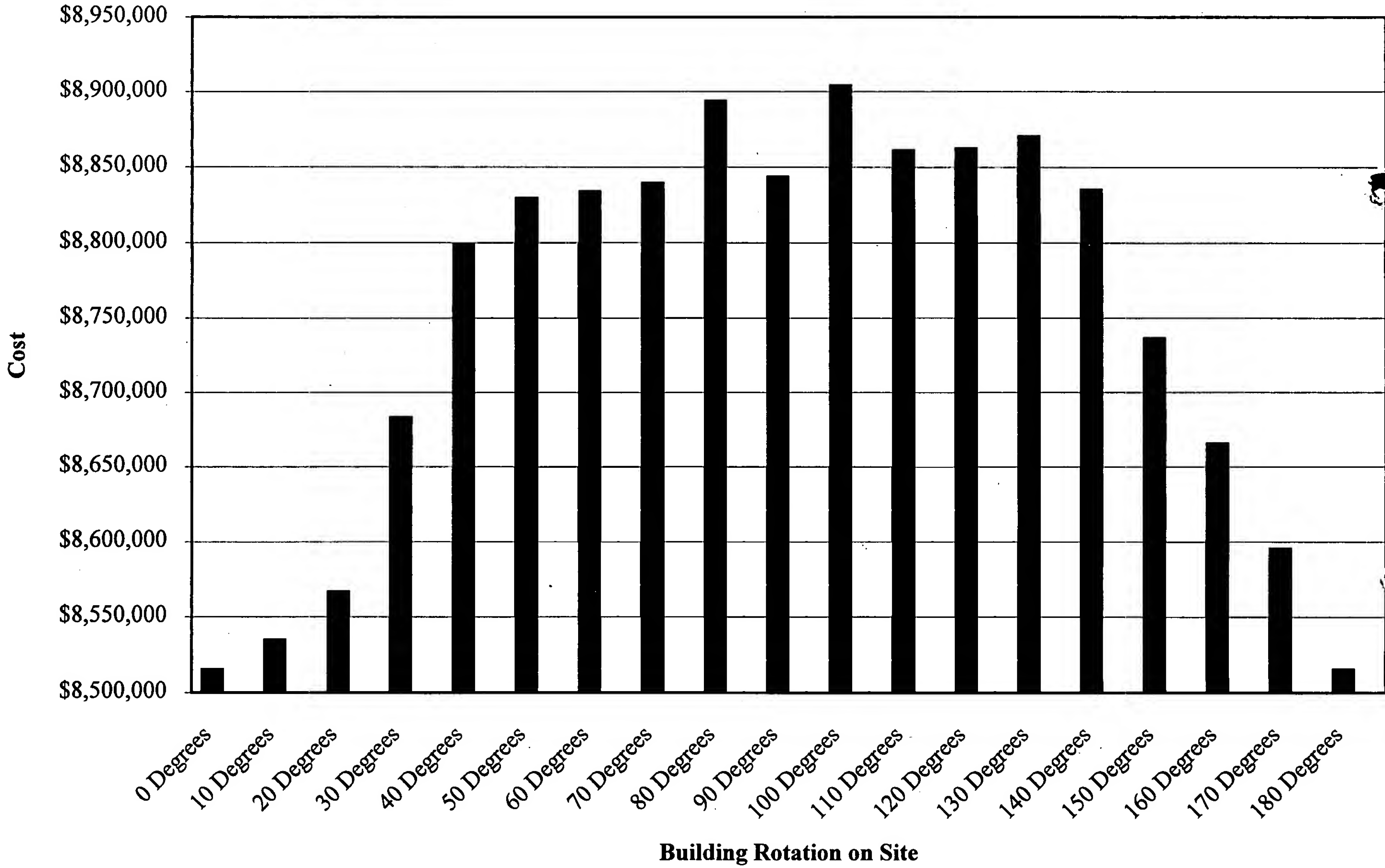


Fig. 6b